



Medicine, Natural Philosophy and Religion in Post-Reformation Scandinavia



Edited by

Ole Peter Grell and Andrew Cunningham

THE HISTORY
OF MEDICINE
IN CONTEXT

Medicine, Natural Philosophy and Religion in Post-Reformation Scandinavia

The close relationship between religion, medicine and natural philosophy in the post-Reformation period has been documented and explored in a body of research since the 1990s; however, the direct and continued impact of Melanchthonian natural philosophy within the individual Lutheran principalities of northern Europe in general and Scandinavia in particular still has to be fully investigated and understood. This volume provides insight into how and why medicine and natural philosophy in a ‘liberal’ and Melanchthonian form could continue to blossom in Scandinavia despite a growing Lutheran uniformity promoted by the State. Inspired by research emanating from the Cambridge Unit for the History of Medicine, here a number of young scholars such as Adam Mosley, Morten Fink-Jensen, Signe Nipper Nielsen and Martin Kjellgren are joined with more established scholars such as Andrew Cunningham, Jens Glebe-Møller, Terhi Kiiskinen and Ole Peter Grell to create a volume which deals with not only the major issues, but also the leading personalities of the period.

Ole Peter Grell is Professor in Early Modern History at The Open University, UK.

Andrew Cunningham is former Senior Research Fellow in the Department of History and Philosophy of Science at the University of Cambridge, UK.



Taylor & Francis

Taylor & Francis Group

<http://taylorandfrancis.com>

Medicine, Natural Philosophy and Religion in Post-Reformation Scandinavia

Edited by Ole Peter Grell
and Andrew Cunningham

First published 2017
by Routledge
2 Park Square, Milton Park, Abingdon, Oxon OX14 4RN

and by Routledge
711 Third Avenue, New York, NY 10017

Routledge is an imprint of the Taylor & Francis Group, an informa business

© 2017 selection and editorial matter, Ole Peter Grell and Andrew
Cunningham; individual chapters, the contributors

The right of Ole Peter Grell and Andrew Cunningham to be identified as
the authors of the editorial material, and of the authors for their individual
chapters, has been asserted in accordance with sections 77 and 78 of the
Copyright, Designs and Patents Act 1988.

All rights reserved. No part of this book may be reprinted or reproduced or
utilised in any form or by any electronic, mechanical, or other means, now
known or hereafter invented, including photocopying and recording, or in
any information storage or retrieval system, without permission in writing
from the publishers.

Trademark notice: Product or corporate names may be trademarks or
registered trademarks, and are used only for identification and explanation
without intent to infringe.

British Library Cataloguing in Publication Data

A catalogue record for this book is available from the British Library

Library of Congress Cataloging-in-Publication Data

A catalog record has been requested for this book

ISBN: 978-1-4724-3958-1 (hbk)

ISBN: 978-1-315-59471-2 (ebk)

Typeset in Bembo
by Apex CoVantage, LLC

Contents

	<i>List of figures</i>	vii
	<i>Contributors</i>	viii
	<i>Acknowledgements</i>	ix
1	Introduction OLE PETER GRELL	1
2	Philip Melanchthon and his significance for natural philosophy ANDREW CUNNINGHAM	8
3	Daniel Sennert and the chymico-atomical reform of medicine JOEL A. KLEIN	20
4	The changing face of Lutheranism in post-Reformation Denmark RASMUS H. C. DREYER	38
5	After Tycho: Philippist astronomy and cosmology in the work of Brahe’s Scandinavian assistants ADAM MOSLEY	60
6	The Book of Nature and the Word of God: Lutheran natural philosophy and medicine in early-seventeenth-century Denmark and Norway MORTEN FINK-JENSEN	82
7	Holger Rosenkrantz, ‘the Learned’ (1574–1642) JENS GLEBE-MØLLER	99

8	The significance of monstrous births in Thomas Bartholin's natural philosophy	117
	SIGNE NIPPER NIELSEN	
9	Three seventeenth-century manuals on how and where to study medicine	136
	OLE PETER GRELL	
10	The natural philosophy of Sigfrid Aronus Forsius: between the created world and God	153
	TERHI KIISKINEN	
11	Johannes Bureus and the <i>prisca astronomia</i>: a Lutheran antiquary engages with the new science	171
	MATTHEW NORRIS	
12	By natural means: magic and medicine in Ericus Johannis Prytz's <i>Magia incantatrix</i> (1632)	199
	MARTIN KJELLGREN	
	<i>Index</i>	217

Figures

11.1	KB MS Fa. 11, fol. 18v	177
11.2	Bureus’s designs of an astrolabe (left) and ‘octant’ (right). KB MS Fa. 2, fols. 61v–62r	179
11.3	Bureus’s depictions of a ‘Geometrical miracle’ (left page, left-hand side), the ‘Bureus Plough’ (left page, bottom), and the ‘Duodecant’ (right page). KB MS Fa. 2, fols. 62v–63r	179
11.4	<i>Hebraeorum philosophia antiquissima</i> (Uppsala, 1641)	188

Contributors

Andrew Cunningham, Senior Research Fellow, History and Philosophy of Science, University of Cambridge, United Kingdom

Rasmus H.C. Dreyer, Research Associate, Department of Church History, University of Copenhagen, Denmark

Morten Fink-Jensen, Lecturer, Saxo-Institute, University of Copenhagen, Denmark

Jens Glebe-Møller, Emeritus Professor, Department of Church History, University of Copenhagen, Denmark

Ole Peter Grell, Professor of Early Modern History, Department of History, The Open University, United Kingdom

Terhi Kiiskinen, Research Fellow, Department of Philosophy, History, Culture and Arts Studies, University of Helsinki, Finland

Martin Kjellgren, Senior Lecturer, Historical Studies, Faculty of Education and Society, University of Malmö, Sweden

Joel A. Klein, Lecturer, Department of History, Columbia University and Postdoctoral Research Fellow in Center for Science and Society at Columbia University

Adam Mosley, Associate Professor, Department of History and Classics, University of Swansea, United Kingdom

Signe Nipper Nielsen, Postdoctoral Research Fellow, Saxo-Institute, University of Copenhagen, Denmark

Matthew Norris, Postdoctoral Research Fellow, Department of Arts and Cultural Science, University of Lund, Sweden

Acknowledgements

Most of the chapters in this book were presented at a workshop at the University of Copenhagen in April 2013, organised by Ole Peter Grell, Department of History, the Open University, and Carsten Selch Jensen, Department of Church History, University of Copenhagen.

We thank the Wellcome Trust and the Department of Church History, University of Copenhagen, for their generous financial support which made this workshop possible. We should also like to thank the administrative staff of the Department of Church History at the University of Copenhagen for their support in organising the workshop.

The editors and organiser also wish to thank the contributors and those who took part in the workshop in Copenhagen for their enthusiastic scholarly engagement with the topic, as well as those contributors who kindly agreed to be part of this volume at a later stage.



Taylor & Francis

Taylor & Francis Group

<http://taylorandfrancis.com>

1 Introduction

Ole Peter Grell

Evangelical ideas had reached Scandinavia by 1520 and quickly gained a following. Both the kingdoms of Denmark-Norway and Sweden-Finland experienced Lutheran Reformations during the sixteenth century and had become prominent Lutheran kingdoms by the start of the Thirty Years' War.¹ However, the process by which they reached a reformation proved very different.

The Union of the Scandinavian Kingdoms had collapsed following the failed attempt of King Christian II to suppress the movement for greater Swedish independence when he massacred more than eighty members of the Swedish lay and ecclesiastical aristocracy in Stockholm in 1520. By 1521, Sweden had been re-established as an independent kingdom under the rule of Gustav Vasa. Two years later, King Christian II was deposed by the Danish Council (*Rigsrådet*), which immediately elected his uncle Duke Frederik of Schleswig and Holstein as king. By the summer of 1523, two usurpers, Gustav Vasa and Frederik I had in other words succeeded to the thrones of Sweden-Finland and Denmark-Norway respectively. Both were positively inclined towards the new evangelical ideas and saw them as useful for their aim of establishing national churches under royal control. Where Gustav Vasa was guided primarily by political and economic considerations, Frederik I and later his son Christian III were to a considerable extent influenced by their evangelical, Lutheran faith.²

The constant threat presented by the deposed and exiled king, Christian II, and his Habsburg family to the new rulers of Sweden and Denmark endured until the 1530s. It resulted in some cautious, political co-operation between Gustav Vasa and Frederik I, even if Gustav Vasa doubted the sincerity of Frederik I and especially that of his son Christian III, whom he was convinced intended to re-create the Scandinavian Union under Danish control. This was not just paranoia from Gustav Vasa; his position remained at risk well into the 1540s, confronted as he was with a number of internal revolts and a lack of external recognition of the legitimacy of his rule. Here Frederik I and Christian III were in a far better position belonging to the royal family having been next in line of succession to Christian II.

Both Gustav Vasa and Frederik I found themselves seriously in debt by the time they succeeded to the throne. Once again, Gustav's situation was far worse than that of Frederik I because of the cost of the lengthy military campaign

needed to defeat the supporters of Christian II in Sweden; however, the largely unopposed military advance of Frederik I through Jutland to Copenhagen did come at a price too. In both countries, this caused serious economic and fiscal problems for years to come. The kingdoms' finances were further undermined by the many rebellions in Sweden by the Catholic peasantry and by the civil war in Denmark between 1534 and 1536 leading up to the reformation of the kingdom.³

Popular support for the new evangelical ideas was undoubtedly much stronger in Denmark than Sweden during the first decades of the sixteenth century. This was most likely due to the fact that Denmark was by far the most urbanised country in Scandinavia. More than 10 per cent of the population lived in cities and towns, such as Copenhagen, Malmö, Elsinore, Odense, Aalborg, and Aarhus, which ranged in size from between 8,000 to 2,000 inhabitants. Less than 5 per cent of the population of Sweden lived in towns, and only Stockholm, which had a population estimated somewhere between 4,000 and 6,000 inhabitants, could lay any claim to urban status. Most other Swedish towns were little more than large villages, while both Norway and Finland were even more rural in character.⁴

Consequently, Denmark experienced a full Reformation decades before the other Scandinavian countries receiving its Lutheran Church order in 1537. It had been written under the supervision of Luther's trusted colleague and friend, Johannes Bugenhagen, who had been dispatched to Copenhagen. The new Lutheran church in Denmark closely followed the Wittenberg model, and for the next couple of generations, most of the leading Danish theologians, from Peter Palladius, via Niels Hemmingsen, to Hans Poulsen Resen, attended the University of Wittenberg.

The Swedish Reformation proved considerably more tortuous and much slower than the Danish. Sweden did not receive a Protestant Church Order until 1571 and then only in a confessionally vague form. It was not until the Uppsala Assembly of 1593 that Sweden finally opted for Lutheranism. For most of the sixteenth century, Sweden remained the religiously most heterodox of the Scandinavian kingdoms. It was torn between Lutheranism, Calvinism, and Catholicism, throughout the second half of the sixteenth century. In many ways, this was a bequest from the reign of Gustav Vasa (1521–1560). The King had remained firmly in control of all ecclesiastical matters in his realm during the last twenty years of his long reign, but had avoided making any final decisions about ecclesiastical organisation and confessional matters. The fact that he chose Calvinist tutors for his sons the later Kings Erik XIV and Karl IX is also indicative that confessional orthodoxy was far from the concerns of Gustav Vasa. The result was that the Swedish Church continued to be led by the Archbishop of Uppsala separated legally and practically from the state. This guaranteed that the Swedish church could pursue its own church policy, given the right political and ecclesiastical circumstances, as it did during the reign of Gustav Vasa's three sons Erik XIV, Johan III, and Charles IX.

The lack of institutionalisation of the Reformation in Sweden, however, exposed the Swedish Church to the changing religious views of the reigning monarchs. Thus, during the first years of the reign of Erik XIV, Calvinism was gaining ground until the King and his Huguenot advisors were confronted by the Archbishop and the predominantly Lutheran hierarchy of the Swedish Church. In the 1570s, Erik's successor Johan III sought to steer the Swedish Church closer to Catholicism, through amendments to the Church Order of 1571, the so-called *Nova Ordinantia* and the introduction of a new liturgy. Johan III probably never intended a return to the Catholic Church, but he encouraged the attempts by Jesuits to introduce the Counter-Reformation in Sweden. The Norwegian Jesuit, Laurentius Nicolai, who arrived in Stockholm in 1576 managed to ingratiate himself with the King to the extent that he was allowed to open a theological college in the former Franciscan monastery in the city. This was a shrewd move by Laurentius Nicolai, having quickly identified one of the major weaknesses of the Swedish Reformation: the dearth of Protestant secondary and tertiary education in the country.

The University of Uppsala had been closed since 1516 and despite attempts by both Erik XIV and Johan III to reinvigorate it, little had been achieved and there was nowhere in Sweden where the clergy could be properly educated. For two years, Laurentius Nicolai's Jesuit 'college' managed to fill this void with considerable success until riots in Stockholm resulting from his public divulgence of being a Jesuit forced Johan III to close it down. It was only in the wake of the Uppsala Assembly in 1593, which finally confirmed the Swedish Church as Lutheran, that it was decided to re-open the University of Uppsala. The official opening of the university took place in 1595 under the sponsorship of Duke Charles, the later Charles IX.

The Jesuit attempt to infiltrate Sweden, however, served to undermine the reign of Johan's son, the Catholic King Sigismund of Poland, who was eventually deposed in 1599 after only six years on the throne. The Protestant opposition to the pro-Catholic policies of Johan and Sigismund was openly encouraged and supported by Duke Charles. Several prominent bishops of the Swedish Church sought sanctuary in Charles' duchy only to return after Sigismund's defeat in the civil war in 1599. Charles upon taking over from Sigismund found that many of the Lutheran bishops he had offered protection during the reigns of Johan and Sigismund now turned against him. They accused him of crypto-Calvinism and for seeking to bring the Church under royal control.⁵

The fact that Charles IX was interested in plans for Protestant unification confronted as it was with resurgent Counter-Reformation Catholicism may well have helped bring about these accusations. Thus in 1608, the king organised a religious disputation between the Scottish, Calvinist minister, John Forbes, who had arrived in Stockholm and his Lutheran Archbishop, Olaus Martini. It would appear that Charles IX was still contemplating such a scheme two years later when John Forbes made a second visit to Sweden. His son, Gustavus Adolphus, retained this interest in unification of the different Protestant

denominations. King Gustavus Adolphus and his closest advisors Axel Oxenstierna and Johan Skytte actively promoted John Dury's well-publicised plans for a merger of the Protestant churches and later invited his friend and associate Amos Comenius to Sweden. This was done despite forceful opposition from the Lutheran leadership of the Swedish church.⁶

As opposed to Sweden the Reformation in Denmark proved remarkably stable. The Church Order of 1537 offered a solid foundation for a supple anti-doctrinal Lutheranism, which, at least from the government's perspective, remained unchanged throughout this period, even if the dominant theology of the church gradually moved in a more 'liberal' Melanchthonian direction, as can be seen from the example of Niels Hemmingsen.⁷ The Danish kings, Christian III and his son Fredrik II, actively discouraged religious debate, and not until the second decade of the seventeenth century, in the reign of Christian IV, as a reaction to Counter-Reformation Catholicism on the one hand, and Calvinism on the other, did the Danish church witness a struggle over doctrine. Even so the outcome was never in doubt. Bishop Hans Poulsen Resen's drive for Lutheran uniformity was an integral part of the government's drive towards more absolutist policies. Resen's drive towards Lutheran uniformity bore greater similarities with the church policy pursued in England by Archbishop William Laud in the 1630s than the push towards a confessional Lutheran orthodoxy which engulfed a number of German territorial states in the same period.⁸

As opposed to Sweden, Denmark also benefitted from an extended period of internal peace and stability, which made it possible for the government gradually to put a new Lutheran ecclesiastical administration in place and to build up a network of Lutheran Latin schools.⁹ The University of Copenhagen was only closed for six years, between 1531 and 1537, because of the disturbances linked to the Reformation, and when reopened, was re-modelled on the University of Wittenberg. This focus on improving the educational and institutional framework for the new Lutheran church was temporarily halted by the Seven Years' War with Sweden from 1563 to 1570. The Peace of Stettin in 1570, however, saw renewed efforts put in place to improve both secondary and tertiary education in the country, while the much improved economic conditions made it possible to augment the salaries of professors, ministers, and teachers considerably while making grants available for talented students.¹⁰

By the end of the sixteenth century, the University of Copenhagen was able to employ a full complement of highly qualified professors in most subjects. Some of these men such as the professor of theology, Niels Hemmingsen, and the professor of medicine, Caspar Bartholin the Elder, achieved international fame through their publications.¹¹ By then the Royal Court regularly employed talented Paracelsian physicians such as Peter Severinus the Dane, and later the iatrochemist/physician Peter Payngk, who had spent time at the court of Emperor Rudolph II in Prague. In 1609, Christian IV built a distillation house in the garden of Rosenborg Castle so Peter Payngk could produce the medical remedies he required.¹²

At the same time, Tycho Brahe's 'research centre' on the Island of Hven was established in 1576. Tycho's personally designed the new research facility, Uraniborg, which was ready five years later with a wealth of astronomical instruments and an alchemical workshop. Brahe attracted a considerable number of talented scholars and a constant stream of visitors until he eventually left Hven in 1597. Many of Tycho Brahe's assistants went on to impressive careers at the University of Copenhagen such as Cort Aslaksson who became professor of theology, Christian Hansen Riper who became professor of Greek, Gellius Sascrides who became professor of medicine, and Christian Sørensen Longomontanus who became professor of mathematics and astronomy, to mention some of the most prominent.¹³

The nobleman, Holger Rosenkrantz the Learned, who had visited Tycho Brahe on Hven in 1592 and again at Wandsburg in 1598, became a friend and sponsor of Brahe. After his marriage to Tycho Brahe's niece, Holger Rosenkrantz settled at Rosenholm Castle where he established an informal school or academy for talented youngsters. Rosenkrantz built the library at Rosenholm into one of the most impressive in northern Europe, became part of the international republic of letters, and collected manuscripts, antiquities, and scientific instruments.¹⁴

Both Uraniborg from 1576 to 1597 and Rosenholm Castle from 1598 to 1615 offered important additional scholarly centres to the University of Copenhagen, even if they catered for very different clienteles. Uraniborg attracted young and ambitious scholars who engaged in observations and experiments from astronomy to alchemy, whereas the academy on Rosenholm Castle was aimed at teenagers.

In 1586, King Frederik II had turned the former monastery of Sorø into a secondary boarding school primarily for sons of the nobility. The school was converted into an academy for the nobility in 1623 by his son Christian IV. The King wanted the academy to supplant the need for young noblemen to go abroad for their education. A number of professors were appointed and gradually the academy became a mini university, and in 1629, it was decided that graduates from Sorø Academy could become ministers of the church. By 1635, the academy recruited a fair number of students from outside the nobility, and eight years later, it was given equal status to the University of Copenhagen.¹⁵ To an even greater extent than Uraniborg and Rosenholm Castle the Academy in Sorø served as an additional centre for tertiary education and research to the University of Copenhagen.

The first two chapters of this volume focus on Wittenberg and its university which proved so significant for secondary and tertiary educational initiatives in Scandinavia in the Reformation period. Andrew Cunningham starts us off with a chapter about how and why Philip Melanchthon transformed natural philosophy into a specific Lutheran discipline and approach to the study of Nature. Joel A. Klein takes a close look at the influential Wittenberg physician and professor of medicine Daniel Sennert (1572–1637), whose many works on medicine proved hugely influential in Scandinavia and beyond. He explores the

extent to which Sennert's ideas were shaped by his forebears in the Wittenberg medical faculty such as Philip Melanchthon's protégé and son-in-law, Caspar Peucer (1525–1602), as well as Sennert's teacher, Jan Jesenius (1566–1621).

The next six chapters focus on medicine, natural philosophy, and religion in post-Reformation Denmark where, as we have seen, the educational and institutional framework was by far the best in Scandinavia and not surprisingly produced a number of scholars of international significance. Rasmus Dreyer demonstrates how Lutheranism changed in Denmark in the century after the Reformation in 1537 and its consequences for both the shape and content of secondary and tertiary education and the roles played by a number of prominent Danish, Lutheran theologians such as Niels Hemmingsen (1513–1600), Hans Poulsen Resen (1561–1638), and Jesper Brochmand (1585–1652) in shaping these policies.

Adam Mosley takes a look at some of Tycho Brahe's Scandinavian assistants and the role of Melanchthonian astronomy and cosmology in their works, focussing in particular on Cort Aslaksson (1564–1624) and Christian Sørensen Longomontanus (1562–1647), who later became professors of theology and astronomy respectively at the University of Copenhagen. Morten Fink-Jensen offers an analysis of Lutheran natural philosophy and medicine in Denmark and Norway in the early seventeenth century, with a special focus on the physician and professor of medicine Caspar Bartholin the Elder (1585–1629), who had achieved an international reputation via his popular anatomical textbook published in 1611.

The focus then moves on to the nobleman Holger Rosenkrantz the Learned (1574–1642), where Jens Glebe-Møller provides us with an assessment of Rosenkrantz's importance and influence in early-seventeenth-century Denmark and beyond. Signe Nipper Nielsen examines the significance of the Melanchthonian natural philosophical tradition in the work of the Danish anatomist Thomas Bartholin (1616–1680). She focusses on Bartholin's fascination with marvellous and exceptional occurrences in nature, especially monstrous births and their significance for Bartholin's natural philosophy. Finally, Ole Peter Grell takes a close look at three seventeenth-century Danish manuals on how and where to study medicine, what remained, and which changes took place in medical education over the century.

The last three chapters of the book are dedicated to developments in natural philosophy, religion, and medicine in Sweden and Finland. In Chapter 10, Terhi Kiiskinen analyses the natural philosophy of the Finnish astrologer and almanac writer Sigfrid Aronus Forsius (1560?–1624) set out in his *Physica*, which he finished in 1611. Matthew Norris's chapter is centred on the Swedish polymath and Royal antiquary Johannes Bureus (1568–1652) and his quest to recover the lost *prisca astronomia*, which formed an important part of Bureus's attempt to recover the lost knowledge of the ancients as a way of understanding Nature. In the last chapter of this volume Martin Kjellgren examines the treatise, *Magia incantatrix* (1632) written by the Swedish minister Ericus Johannis Prytz (1587–1637), demonstrating that even in areas such as illicit magic and

healing, Lutheran orthodoxy proved less restrictive on what was acceptable than has hitherto been acknowledged.

Notes

- 1 See O. P. Grell (ed.), *The Scandinavian Reformation: From Evangelical Movement to Institutionalisation of Reform* (Cambridge, 1995).
- 2 For Sweden see M. Roberts, *The Early Vasas: A History of Sweden 1523–1611* (Cambridge, 1968); for Denmark see T. Lyby, *Vi Evangeliske. Studier Over Samspillet mellem Udenrigspolitik og Kirkepolitik på Frederik I's Tid* (Aarhus, 1993); see also O. P. Grell, 'Scandinavia', in A. Pettegree (ed.), *The Early Reformation in Europe* (Cambridge, 1992), 94–119.
- 3 See M. Schwarz Lausten, 'The Early Reformation in Denmark and Norway 1520–1559' and E. I. Kouri, 'The Early Reformation in Sweden and Finland c.1520–1560', in O. P. Grell (ed.), *The Scandinavian Reformation: From Evangelical Movement to Institutionalisation of Reform* (Cambridge, 1995), 12–69.
- 4 See O. P. Grell, 'Introduction', in O. P. Grell (ed.), *The Scandinavian Reformation: From Evangelical Movement to Institutionalisation of Reform* (Cambridge, 1995), 4.
- 5 See I. Montgomery, 'The Institutionalisation of Lutheranism in Sweden and Finland', in O. P. Grell (ed.), *The Scandinavian Reformation. From Evangelical Movement to Institutionalisation of Reform* (Cambridge, 1995), 144–178.
- 6 See S. Lindroth, *Svensk Lärdomshistoria. Stormaktstiden* (Stockholm, 1975), 168–170.
- 7 For Niels Hemmingsen, see M. Schwarz Lausten, *Niels Hemmingsen. Storhed og fald* (Copenhagen, 2013).
- 8 See T. Lyby and O. P. Grell, 'The Consolidation of Lutheranism in Denmark and Norway', in O. P. Grell (ed.), *The Scandinavian Reformation: From Evangelical Movement to Institutionalisation of Reform* (Cambridge, 1995), 114–143.
- 9 See L. Grane, 'Teaching the People – The Education of the Clergy and the Instruction of the People in the Danish Reformation Church', in L. Grane and K. Hørby (eds.), *The Danish Reformation Against Its International Background* (Göttingen, 1990), 164–184; and Chapter 4.
- 10 See Chapter 4.
- 11 For Caspar Bartholin, see Chapters 6 and 9.
- 12 See O. P. Grell, 'The Acceptable Face of Paracelsianism: The Legacy of Idea Medicinæ and the Introduction of Paracelsianism into Early Modern Denmark', in O. P. Grell (ed.), *Paracelsus: The Man and His Reputation, His Ideas and Their Transformation* (Leiden, 1998), 257.
- 13 For Tycho's assistant, see J. R. Christianson, *On Tycho's Island. Tycho Brahe and His Assistants, 1570–1601* (Cambridge, 2000), 249–381 and Chapter 5.
- 14 See Chapter 7.
- 15 K. Jensen, *Latinskolens dannelse. Latinundervisningens indhold og formål fra reformationen til enevælden* (Copenhagen, 1982), 199–201.

2 Philip Melanchthon and his significance for natural philosophy¹

Andrew Cunningham

‘This whole most beautiful theatre – the Heavens, Lights, Stars, Air, Water, Earth, Plants, Animated beings, and all the bodies of the world – was set up with such skill, ornamented with different kinds, figure, harmony of motions, efficacy of forces, and distributed in order, so that it should be an illustrious testimony of the work of God the creator. And in this splendid home Man has been set up . . . ’²

The Lutheran reform of religion and education began as a two-man affair. It had started in 1517 with Martin Luther famously nailing the ninety-five theses on the door of a church in Wittenberg, theses which challenged many central points of Catholic doctrine and discipline. This particular church was the church of the new University of Wittenberg (founded 1502), where Luther was a professor, as well as being an Augustinian friar. The theses were a challenge to others to participate in a scholastic disputation. During the first tempestuous years of reform and – when the dust had settled – during the years of reconstruction, Luther always had at his side his fellow professor, the educationalist Philipp Melanchthon. Their characters were like their physiques. The one, Luther, was big and bold in body and in his ideas for reform; the other, Melanchthon, was lean and cautious, both physically and politically. Initially the reform impulse meant that the works of the heathen Aristotle – the mainstay of university teaching to this point – had to be rejected. But then the challenge of the yet more radical prophets of Zwickau and others meant that Aristotle had to be reincorporated into the reformed curriculum. Melanchthon is the person who performed this dextrous turn-around, making the heathen Aristotle acceptable to Protestants.

Luther saw to it that the university of Wittenberg was henceforth devoted to the creation and propagation of what was in his eyes a properly Christian curriculum of studies. Under the direction of his soulmate Philipp Melanchthon, ‘the preceptor of Germany’, as he came to be called, it became the mother of Protestant universities.

While the University of Wittenberg was still very new in 1517, its curriculum was not, being based on the pattern of the University of Leipzig.³ Melanchthon’s reforms to this curriculum affected every part of it, and through

the printing of textbooks written mostly by himself, Melanchthon also succeeded in reforming the curricula of other princely universities, which had gone over to Luther. Among the universities founded on the Wittenberg model and following Melanchthon's methods were Nuremberg in 1526, Marburg in 1529, Königsberg in 1544, Jena in 1548. Moreover, Melanchthon had a hand in reorganising Tübingen, Leipzig and Heidelberg universities, while his scholars reorganised Frankfurt-an-der-Oder, Rostock and Greifswald in 1545.

The educational reforms at Wittenberg proved very popular, attracting students from other universities. The historian Friedrich Paulsen recounts that

For forty-two years (1518–1560) Melanchthon lectured at Wittenberg on nearly every philosophical, philological, and historical subject, as they were understood in those days, in his own person representing almost an entire philosophical faculty. After about 1550 Wittenberg was the most largely frequented German university.

From all districts of Germany and Scandinavia and most parts of Europe, 'young men flocked to hear him'.⁴

On arrival, these students also discovered an unexpected novelty: a new and more accessible way of lecturing, beginning with Luther himself, which was often a general exposition, and even spontaneous, rather than a detailed following of particular texts, sentence by sentence, with scholastic exegesis. This is also apparent in Melanchthon's printed works which record his teaching. His first publication – in fact his students put it into print without his permission, so he felt obliged to issue an authorised version – was his *Loci communes rerum theologicarum* of 1521, which might perhaps be translated as *Common-Places of Theological Issues*. This work had started as informal lectures by Melanchthon, initially called *Lucubratiuncula*, viz. little night-thoughts, in this case on the Epistle to the Romans. The work consists of a series of doctrinal positions built solely from the Bible, and thus putting aside the traditional way of arguing used by theologians as they worked their way through texts. Melanchthon's presentation here, by contrast, looked immediate and unbiased by any prior theological position – the points were supposedly commonly held, or commonsensical, positions, after all – but of course it actually represented Luther's thinking to this point. By the time he published his *Revised Book on the Soul* in 1552, Melanchthon could even adopt a simple question-and-answer presentation: 'What is the soul?', 'How does nutrition take place in the human body?' and so on, all of which improved the accessibility of his teaching materials.

God, creation and providence

The educational reforms that Melanchthon instituted put God – that is God as understood rightly from a Lutheran perspective – at the centre of everything, even more so perhaps than in the Catholic university education it sought to

replace. So he could take the divisions of the medieval educational programme and treat them as serving the needs of the reformed Church:

Grammar gives us the meaning of the original text of Holy Scripture, Dialectic serves the understanding of the text and the consistency of the sermon's content, while Rhetoric gives us God's Word in a way that makes it vivid and effective.⁵

What was the God of early Lutheran Protestantism like? From the criticisms that Luther made of Catholicism, and the claims he made for the nature of true Christianity, we can infer several things.⁶ First, this God was immediate, and immediately accessible. He did not need a class of dead saints to intercede with Him on behalf of ordinary Christians. Nor did He need a hierarchy of priests and bishops to represent the needs and prayers of ordinary Christians. Nor did He require a learned class to read and interpret the sacred scriptures to ordinary Christians, translating and interpreting them from one language (Latin) to another (in this case German). Instead, this God regards the Bible as being directly in front of the eyes of the Christian, and its meaning needs no priestly interpreter.

Second, we can see that this God was not impressed by good works as a means to salvation: rather, He demanded trust in faith alone (*sola fide*) in Christ as the saviour.

Third – and this will turn out to be the most important characteristic of the Lutheran God in this chapter – was the view that this God actively and with great forethought provided for all parts of His creation, especially of course, man. In a word, He was *providential*, exercising His providence at every turn. And this care, this providence, for all His creation could be witnessed daily by believers who studied that creation. The study of nature – that is, of creation – showed not only the awesome creativity of God, but his constant care of that creation. It was thus, in the eyes of Melanchthon, incumbent on the true Christian not just to take this providence for granted, but to look at and see God's providential arrangements at first hand.

The concept of providence as an attribute of God was of course well known to Catholic theologians, especially Aquinas; but modern scholars have recognised a special emphasis on God's providence for man and the universe on the part of Luther and Melanchthon. Indeed, in the conclusion to her book (1995) *The Transformation of Natural Philosophy*, Sachiko Kusukawa claims that while Catholics had earlier used natural philosophy as one key to the knowledge of God, they also used the Schoolmen and their commentaries to interpret it, which had led them to the position that *rational* knowledge of God was both possible and necessary. With Melanchthon, by contrast, natural philosophy was 'knowledge of Law' (according to Kusukawa), and it taught self-knowledge and the greatness of the Providential Creator (which in turn downgraded works righteousness). 'That this Providence of God was visible through this Creation was due to the Lutheran conviction that spirituality lay in material things', that

is to say, in natural philosophy you can actually see the Providence of God in creation. ‘Melanchthon’s natural philosophy offered *a posteriori* arguments in order to confirm a single point about the divinity, that God created and sustains everything in this physical universe with Providential design’. And this providentialism – that is, the view that all’s right with the world as it is, because that’s the way God wants it – underpins Melanchthon’s view that civil disobedience was bad, which was the basis of his whole view of civil society.⁷

So this brings us to one of the crucial areas of the reform of university studies that Melanchthon pursued, which was in *natural philosophy*, the discipline where nature or creation was studied and discussed.

As we shall see, physics (*physica*) was a major part of natural philosophy, but there were other major areas within natural philosophy too. Both before and after the Melanchthonian reforms natural philosophy studied nature as created by God (unlike science today). That is to say, natural philosophy studied the creatures – that is everything, from stars to rocks to man – which had been created by the Christian God, the Creator, at the Creation. And up to this point the creatures and their rationales had been studied in universities via the works of the old heathen Aristotle. But the Reformation now meant a reform in the relation that was held to subsist between God and man, as we have just seen. So the nature and functioning of the soul – essential concerns of Aristotelian natural philosophy – were also conceived of in new ways. Melanchthon wrote two natural philosophical treatises. Their titles might seem unexpected to the modern reader at first sight. They are (1) *A Commentary on the Soul* (*Commentarius de anima*, 1540), and (2) *Revised Book on the Soul* (*Liber de anima, recognitus*, 1552, and many editions to 1584).⁸ The soul is meant here in two ways: first as the immortal soul, as is so familiar in the Christian tradition. But second, it is the soul in the primary sense used in Greek philosophy, especially by Plato and Aristotle, the soul as the man himself and the centre of all the sensation, perception, thinking and action of the body.⁹ This is the sense in which Melanchthon (like other people) regarded the study of the soul as an essential part of natural philosophy. Finally, in the discipline of natural philosophy Melanchthon also wrote (3) *Basics of Physics* (*Initia doctrinae physicae*, 1549, and further editions), which deals with physics and the physical world more widely.¹⁰

My discussion here follows these changes in teaching as they affected natural philosophy both at Wittenberg, changes which subsequently were deployed across the other princely Lutheran universities.

Natural philosophy was one of the three philosophies that constituted the core of the basic student curriculum in the medieval and early modern university. Students started with (1) rational philosophy, which meant the seven liberal arts; that is the three arts of language: grammar, logic, rhetoric; and the four arts of number: arithmetic, music, geometry and astronomy. They then moved on to (2) natural philosophy and finally to (3) moral philosophy. The natural philosophy in the basic course for a degree in arts or philosophy was studied almost entirely out of the ‘nature books’ of Aristotle. At this point, students were examined orally, and if found satisfactory, were awarded a degree in arts. Students

were then considered competent to move on to one of the higher faculties if they wished, that is to either theology, or law (civil or canon), or medicine.¹¹

One major point needs to be made before we proceed further. Until recently, historians, and especially historians of science, have regarded this natural philosophy as simply an early version of (modern) science, and therefore overwhelmingly secular in outlook. It is a commonplace today among historians of ‘medieval science’ that there was no conflict between, on the one hand, this (supposedly early) science, and on the other, theology as taught also in the universities.¹² However, recent studies by myself and others have established that this natural philosophy was in fact thoroughly integrated with Christian religious views – that it was the study of nature, using primarily Aristotelian texts, but of nature as created by the Christian God. It has been amply shown that this was the case before the Reformation in the universities, which were of course all Catholic.¹³ As will be seen below, it was also as much or even more so the case after the educational reforms introduced by Luther and Melanchthon in the new Protestant universities.

First curriculum reform: the fall and rise of Aristotle

As soon as the major figures of the university of Wittenberg had been won over to Luther’s new theology ‘a revision of the curriculum was felt imperative. Luther spearheaded this movement’.¹⁴ What this involved were basically two changes. The first was to introduce teaching in two ancient languages – Greek and Hebrew – so that the new Christian could read the Bible in its original languages for himself or herself. Melanchthon was appointed at Wittenberg to teach Greek in August 1518, to promote this aim.

The second was that the works of Aristotle should be removed from the curriculum as far as possible. Luther laid out his position in typically direct tones when he wrote to Georg Spalatin, the Elector’s librarian and secretary, in March 1519:

Aristotle’s *Physics* is a completely useless subject for every age. The whole book is a debate about nothing. . . . In [Aristotle’s *Physics*] there is no real knowledge of the world of nature. His works on Metaphysics and the soul are of the same quality. It is, therefore, unworthy of [Melanchthon’s] intellect to wallow in that mire of folly.¹⁵

The young new professor of Greek, Melanchthon, backed up Luther’s position here very strongly, maintaining that Aristotle was a major impediment to the Christian scholar, not only for Aristotle’s errors, such as his belief that the world was not created but eternal, but also because scholastic theology – that useless and destructive theology – had been constructed upon issues and distinctions taken from Aristotle’s works. There is no way that human reasoning, as promoted by Aristotle, could contribute to the true knowledge of God.

But then suddenly in 1521, Luther and his sidekick Melanchthon had to rapidly retract all their anti-Aristotle rhetoric and move Aristotle and his

works back as the very basis of the philosophy curriculum at Wittenberg. For Wittenberg itself was the centre of early radical diversions from Luther's views, and one of its early leaders was Andreas Bodenstein von Karlstadt, Dean of the Faculty of Theology and a fellow professor with Luther, and who disputed on Luther's side at Leipzig in 1519 against Eck. In 1520 Karlstadt wrote *Verba Dei*, and *De Canonicis*. His biographer says that the first of these arose from an incident at Leipzig where Eck had asked him whether one should say the same thing to illiterate folk that one says in sermons or theological debates. Karlstadt thought about it, concluded, and now proclaimed that, yes, everything in scripture ought indeed to be available to all, not just to the learned. And in the second work, the *De Canonicis*, Karlstadt claimed of the Bible that

under the letters Christ lives, breathes, speaks and explains to all in common. Therefore the interpretation of scripture will belong to all Christians . . . I want that understood thus – all to whom the Lord bestows the gift of interpreting scripture are able to interpret it, whether they be laymen or clerics, secular or religious.

As the historian Ronald Sider puts it: 'In *Verba Dei* he [Karlstadt] urged all laymen to read the Bible; in *De canonicis*, he affirmed their right to interpret it'.¹⁶ The sympathies of Karlstadt, the university teacher, were tending toward the common man.

When Luther was spirited away to the Wartburg castle by his ruler, Frederick of Saxony, after the Diet of Worms in 1521, Karlstadt was prominent in the so-called Wittenberg Movement of late 1521 and early 1522, in which the local friars (Luther's own colleagues) and the students who were suddenly attracted now in great numbers to the little university, excitedly tried to institute the changes they believed Luther had been calling for. They tried to change the mass (indeed to abolish it), they ran riot in the churches, throwing out and destroying the images they found there. But when Luther returned home he saw these changes as a 'theatre of Satan' (*scena Satanae*) and denounced them. Karlstadt, however, made the opposite choice: he now renounced his doctoral title and began to call himself a peasant. He left Wittenberg and went to be a local pastor, farming his own patch of land. He had joined the people. Luther pursued Karlstadt as a heretic.

A second early follower of Luther was Thomas Müntzer, a priest in Zwickau, who preached the new doctrines to the industrial artisans in southern Saxony, who were experiencing the distress of severe inflation and periodic unemployment. Müntzer began to teach a doctrine which was mystical, spiritual and apocalyptic: calling, in the name of the imminent Second Coming and millenium, for bloody revolution and the violent overthrow of established authority. And all this was in favour of the interests of the common man, and against the Lutheran reforms which, to Müntzer, smacked too much of accommodation to the needs of the princes. Lutherans and Catholics were to collaborate in putting the radicals to the sword in order to maintain their own peace.

Together these two radical threats so close to home meant that Luther and his colleagues, including Melanchthon, had to make a rapid rethink about the role of the book, the role of the masters, and in particular the role of Aristotle in the whole university curriculum. It was all about what were the true sources of authority. As Kusakawa has put it:

All these people seemed to claim some special access to the Holy Spirit or sacred knowledge, imposed arbitrary human interpretations on the Bible, and drew out radical messages of action which would have resulted in resisting or overturning the existing political order. Melanchthon saw poor education and confusion of philosophy and theology as the root of the problem. And this is when he turned to Aristotelian philosophy for a solution to the problem of the evangelical radicals.¹⁷

Melanchthon on physics: first, the soul

Melanchthon's nineteenth-century editor, C.G. Bretschneider, wrote that

As Melanchthon was skilled in every kind of knowledge, so he also put great effort into learning physics ('ad cognitionem doctrinam physicam'), which he often praised under the name of *philosophy*, and whose dignity and utility he often commended. In learning physics he worked for many years with his colleague Milich (as he himself says in his letters). But since, as can be found from his letter to Camerarius of 24 May 1535, Melanchthon was not able to finish the work at that time, he chose to finish properly that part of the teaching of physics which concerned *the soul*.¹⁸

Here we shall follow him in this sequence.

Melanchthon dedicated his *Commentarius de anima* (1540) to the Senator Hieronymus Bomgartner. 'Many people', Melanchthon began, 'criticise and object to the rather grand titles of the teaching books I have written, 'On the world', 'On the heavens', 'On the nature of living things', 'On the soul', since those books contain only thin and childish teaching . . . ' To which Melanchthon replies that his writings may be elementary, but we need to advance as much as we can, 'For God orders us to consider His works . . . here we . . . recognise the footprints of God impressed on nature, through which He wishes to be known . . . '

The opening page of the *Commentarius de anima* (1540) is headed 'Book on the soul. Which contains that part of philosophy to which the title is On the Soul'. There is no richer, more erudite, nor sweeter part of physics (Melanchthon writes) than these disputations On the Soul.

For even if the substance of the soul cannot be adequately perceived, yet its actions show the route to knowledge of it. Therefore, when its actions are spoken of, when its powers or forces are discerned, when its organs are

described, in this way the whole nature of the body, and most importantly of the human body, is to be explained. Thus this part ought to be named not just ‘On the Soul’, but ‘On the whole nature of man’. The nature of man embraces a great variety and range of knowledge (*scientiae*) . . .

As we have seen, Melanchthon’s reasons for re-introducing Aristotle’s discussion of the soul and its operations – and especially its account of how the soul receives its information from the senses and most definitely not from inspiration – arose from the local and urgent threat to the Lutheran religious reforms presented by the radicals, and it was thus the immediate political concerns of Lutheran Protestantism which brought Aristotle back into the philosophy curriculum.

Melanchthon and novel teaching in physics and natural philosophy

The question that now needs to be raised is this: was Lutheran natural philosophy, as produced by Melanchthon, in any way accepting of the great challenges to traditional natural philosophy and astronomy which shortly followed the Reformation – as posed for example by Copernicus (a Catholic, indeed a cleric) in the shape of the heliocentric system of the universe; by Galileo (a Catholic) with respect to the whole of Aristotelian physics; by Kepler (a Lutheran) and Tycho Brahe (a Lutheran) with their differing interpretations of the operations of the Sun and planets; or by Vesalius (a Catholic), with his loud criticisms of the anatomical work of Galen? These questions need to be raised, even though it is probably too early in terms of research to offer much in the way of substantive answers to them. I shall here briefly discuss two of these.

Copernicus and astronomy

First, with respect to the challenge that the Copernican heliocentric theory, published in 1543 as *On the Revolutions of the Heavenly Spheres*, gave to Melanchthon’s thinking. Melanchthon expressed his view on the importance of the study of mathematics and astronomy in an oration as follows:

To recognise God the Creator from the order of the heavenly motions and of His entire work, *that* is true and useful divination, for which reason God wanted us also to behold His works. Let us therefore cherish the subject which demonstrates the order of the motions and the description of the year . . . in the sky, God has represented the likeness of certain things in the Church. Just as the moon receives its light from the sun, so light and fire are transfused to the Church by the Son of God.¹⁹

But this trust in ‘seeing is believing’, which leads one to admiration of God’s providence, may have been why Melanchthon was hesitant to accept the Copernican view. Charles Leander Hill writes that in the *Initia physicae* Melanchthon

cannot accept the Copernican view because it conflicts with revealed truth in the Bible.

Yet there is another reason why he parted the way with Copernicus and held fast to the Aristotelio-Ptolomaic universe: the superiority of the latter view is seen in the fact that such a world-scheme presented a framework which corresponded with the teaching of sensuous perception. And for the naive Melanchthon *videre est credere*. For in his lectures on physics, Melanchthon combines Aristotelian physics and Ptolemaic astronomy with certain Biblical imagery: a combination quite easy to make, since the whole world-scheme was based on immediate sense data.²⁰

This ‘Melanchthonian’ view was then spread among the newly reformed universities by astronomers, mathematicians and philosophers who had been trained by Melanchthon in Wittenberg. Robert Westman has argued that this was a distinctive ‘Wittenberg interpretation’. In essence, this involved treating Copernicus’s system as a useful theory, but not as an account of reality. ‘Thanks to the efforts [of this group]’, Westman writes, ‘the realist and cosmological claims of Copernicus’ great discovery failed to be given full consideration’ (p. 168). In effect, Westman argues, in the initial years of its study, the Copernican system could be used for the improvement of observations, systematisation of tables, and as models, but without being either accepted or rejected in its totality (p. 174). This of course contrasts markedly with the orthodox view adopted by the Catholic Church for centuries to come.

Vesalius and anatomy

Aristotle’s *De Anima*, *On the Soul*, had been an important text in the philosophy course for hundreds of years, dealing as it does with the nature and essence of the human soul and with its attributes, actions and properties. But Melanchthon was the first person for centuries – possibly the first since Aristotle himself – to treat the *De Anima* as requiring or necessitating a knowledge of anatomy. For what Melanchthon claims is that the *De Anima* cannot be rightly understood without at least some knowledge of the body itself.²¹

That anatomy was totally God centred. The knowledge of anatomy, Melanchthon writes (attributing the sentiment to Galen) leads us to the knowledge of God: *Galenus praeclare dixit, Anatomiae scientiam, ducem nobis esse ad Dei cognitionem*. Melanchthon gives a quite extensive listing of the outer parts of the human body, and then turns to the inner ones:

At this point truly you think yourself introduced into a temple and a kind of shrine; on this account you ought not to simply look at the material with particular reverence, but to take into consideration the plan and diligence of the Maker. For the scheme of the work bears witness that men

do not exist by chance, but take their rise from some infinite Mind which has arranged its individual parts with astonishing care and destined them to certain goals and which has impressed knowledge and mind on it, which is the clearest mark of divinity.

Melanchthon then goes through the inner parts ‘following the order of Galen’, from the lower venter through to the highest. All this was taught without performing a dissection, and it is not known whether Melanchthon used any visual representations.

Twelve years later, Melanchthon issued his much revised version of this book as *Liber de Anima Recognitus*. In the meantime, of course, Vesalius’ *Fabrica* had been published in Basle in 1543. Melanchthon acquired a copy and read it with care.

In his revision of his commentary on the soul (made from June to November 1552), Melanchthon spoke about the anatomy of the human body in a way which echoed St Paul writing to the Corinthians:

looking at this wonderful variety of work and these designs of God from without and through a thick darkness, we are struck dumb and grieve that we cannot look into nature and discern causes. But then at last when we discern the ‘idea’ of nature in the divine mind we shall look into that whole machine as if from the inside, and we shall understand the designs of the Maker and the causes of all the divine works. Now, through this incomplete consideration, we know that God is the Architect, and we should be inflamed with desire for that perfected wisdom.

The message is that the knowledge of anatomy is for Protestants an important means to the knowledge of God: Melanchthon is saying that through anatomy we see God ‘through a glass darkly’ – the best that can be obtained here on earth – ‘but then face to face; now I know in part, but then shall I know even as also I am known’ (I Corinthians 13,12). Aware of the shortcomings of his work, however, Melanchthon urged anyone else who was to teach this anatomy to others to amend any errors he may have made, especially since there exist the figures of Vesalius, and the most excellent descriptions, about which Paulus Eberus has written thus:

Quantum nocte alias stellas, cum lumine fratris
Orbem complevit, vincere Luna solet:
Vesalii tantum reliquis liber anteit unus,
Corpora qui qua sint condita ab arte, docent.

As much as the Moon regularly outdoes the other stars at night, when it fills the orb of its brother [i.e. the earth] with light, so does the one book of Vesalius surpass the others which teach by what art our bodies have been fashioned.

God is even more present in this revised account than in Melanchthon's earlier one, with the heart now portrayed as the domicile of God, the brain as His temple. This work went through many editions (1558, 1560, 1562, 1569, 1571, 1574, 1584), mostly at Wittenberg. Anatomical sheets, based on the figures of Vesalius, were printed to be used with it (see Figures 44 and 45). Such teaching of anatomy in the philosophy course became common in Reformed universities too, as at Glasgow in the 1570s and Edinburgh in the 1580s, and such teaching continued throughout the seventeenth century.

Thus, quite independently of any concern about the advancement or promotion of medicine, Protestantism thus had a new, more philosophical and theological role for anatomical knowledge. For the Lutheran Protestant, the human body was the temple of God, and seeing was believing.

Notes

- 1 The basic work on Luther's and Melanchthon's natural philosophy and its relation to Lutheran religious reform is Sachiko Kusukawa, *The Transformation of Natural Philosophy: The Case of Philip Melanchthon* (Cambridge, 1995), which I draw on frequently here. A briefer account is given by her in 'The Natural Philosophy of Melanchthon and His Followers', in Catherine Brice and Antonella Romano (eds.), *Sciences et religions de Copernic à Galilée (1540–1610)* (Rome, 1999), 443–453. Subsequent publications dealing with these issues are Dino Bellucci, *Science de la nature et Réformation: la physique au service de la Réforme dans l'enseignement de Philippe Mélanchthon* (Rome, 1998), and Ralf-Dieter Hofheinz, *Philipp Melanchthon und die Medizin im Spiegel seiner akademischen Reden* (Herbolzheim, 2001). See also Sachiko Kusukawa (ed.) and Christine Salazar (tr.), *Philip Melanchthon, Orations on Philosophy and Education* (Cambridge, 1999).
- 2 The dedication of *Initia doctrinae physicae* 1563 by Melanchthon to Michael Meienburg, mayor of Nordhausen, my translation.
- 3 An excellent account of the University of Wittenberg before and after 1517 is given by Ernest G. Schwiebert, 'New Groups and Ideas at the University of Wittenberg', *Archiv für Reformationsgeschichte* 49 (1958), 60–78, even though he only deals with the theology faculty.
- 4 Friedrich Paulsen, *The German Universities: Their Character and Historical Development* (German original 1893), translated 1895 by Edward Delavan Perry (London, 1895), 43.
- 5 Deszo Buzogany, 'Melanchthon as a Humanist and Reformer', in Karin Maag (ed.), *Melanchthon in Europe: His Work and Influence Beyond Wittenberg* (Grand Rapids, Michigan, 1999), 87–101, 88.
- 6 I put it this way because to this non-believer, it is self-evident that characterisations of Gods are human constructs, projections of social and political experiences, expectations, and ideologies. Believers of course necessarily see things the other way around.
- 7 Kusukawa, *The Transformation of Natural Philosophy*, 201–202.
- 8 *Liber de anima recognitus ab autore* is 1552 – and this is the version reprinted in *Corpus Reformatorum*, vol. 13.
- 9 These two meanings have a common root in the sense that the soul of the Greek philosophers was adopted into Christianity as the immortal soul.
- 10 *Initia doctrinae physicae dictata in academia Vuitebergens*, published first in 1549; new posthumous edition *Iterum edita cum indice & annotationibus* (Leipzig, 1563). The 1549 version is the one reprinted in *Corpus Reformatorum*, vol. 13, but without the dedication; the editor says the work was reprinted in Wittenberg in 1555, 1559, 1575. For a translation of part of the dedication, which repeats Melanchthon's refrain that 'every hint of the harmony

- of this fair creation forms a step toward the knowledge of God, and towards virtue', see Clyde Leonard Manschreck, *Melanchthon the Quiet Reformer* (New York, 1958), 148.
- 11 Canon law, that is the law of the Catholic Church, was abandoned by Lutherans and other Protestants.
 - 12 The main defender of this position today is Edward Grant. See for instance his *A History of Natural Philosophy from the Ancient World to the Nineteenth Century* (Cambridge, 2007).
 - 13 Andrew Cunningham and Sachiko Kusukawa (tr. and eds.), *Natural Philosophy Epitomised: Books 8–11 of Gregor Reisch's Philosophical Pearl (1503)* (Farnham, Surrey, 2010).
 - 14 Kusukawa, *The Transformation of Natural Philosophy*, 34.
 - 15 Translated and quoted in *Ibid.*, 40.
 - 16 Ronald J. Sider, *Andreas Bodenstein von Karlstadt: The Development of His Thought* (Leiden, 1974), 92–93.
 - 17 Introduction to Kusukawa, *Melanchthon Orations*, xvii.
 - 18 *Corpus Reformatorum*, vol. 13, editorial introduction; my translation.
 - 19 As quoted by Robert S. Westman, 'The Melanchthon Circle, Rheticus, and the Wittenberg interpretation of Copernican astronomy', *Isis* (1975), vol. 66, no. 2, 165–193, 170, from William Hammer, 'Melanchthon, Inspirer of the Study of Astronomy: With a Translation of His Oration in Praise of Astronomy (*De Orione*, 1553)', *Popular Astronomy* (1951), 318.
 - 20 Charles Leander Hill, *The Loci Communes of Philip Melanchthon: With a Critical Introduction By the Translator* (Boston, 1944), 48.
 - 21 This section draws extensively on my book, *The Anatomical Renaissance: The Resurrection of the Anatomical Projects of the Ancients* (Aldershot, 1997, reprinted 2003), Chapter 8.

3 Daniel Sennert and the chymico-atomical reform of medicine

Joel A. Klein

Introduction

Following the work of recent historians, much more is now known of Daniel Sennert (1572–1637) and the natural-philosophical, medical, and religious traditions which influenced him.¹ Sennert and many of his colleagues and forebears at Luther's university had benefited from the non-Thomistic Aristotelianism of Julius Caesar Scaliger (1484–1558) and Jacopo Zabarella (1533–1589), as well as a variety of other sixteenth-century medical humanists.² Sennert himself took a special interest in Aristotle's *Meteorology IV*, the chemistry of Andreas Libavius (c. 1555–1616), and the alchemical *minimae* in the *Summa Perfectionis* of Pseudo-Geber.³ This emphasis on Aristotle's natural philosophy at Wittenberg was facilitated by the educational reforms that Philipp Melanchthon (1497–1560) had enacted in the previous century, which likewise led to a tradition of anatomy of which Sennert was a clear beneficiary.⁴ Sennert, however, departed from Melanchthon and his intellectual heir, Caspar Peucer (1525–1602), in his adoption and development of atomism – a topic that these Wittenberg intellectuals had specifically criticised.⁵ Nevertheless, Lutheranism has been shown to be important to other areas of Sennert's work, and namely the traducianism in Sennert's philosophy of generation.⁶

Our understanding of Sennert's larger influence in the Scientific Revolution is also now clearer, but most attention has been directed towards the influence of his atomic natural philosophy on individuals such as Robert Boyle (1627–1691) and Rostock professor Joachim Jungius (1587–1657).⁷ There has been less interest in the influence of Sennert's medicine or its interactions with his chemistry and atomism, and this chapter thus begins to fill these lacunae. I argue that Sennert proposed a major reform of medicine based on his chemistry and atomism, and that the changes he proposed were especially evident in his understanding of pathology and pharmaceutical therapy. Sennert's chymico-medical vision was promulgated via his many books and by his students, many of whom had been a part of his *collegium chymicum*, one of the first courses on chymical medicine associated with a German university. It appears that Sennert's chymical medicine had an especially significant influence throughout Germany and Scandinavia, Lutheran regions which sent many

students to study in Wittenberg. Several new details about Sennert's *collegium* are discussed, but as it would be difficult to determine Sennert's influence without first understanding the major concepts in his own chymical medicine, the focus of this chapter is on Sennert's corpus. In particular, Sennert's understanding of chymico-atomical pathology and pharmaceutical therapy is traced throughout his works, with special focus given to his understanding of gout and venereal disease.⁸ Within Sennert's chymical medicine, the influence of Lutheranism is primarily seen in his notion of medicine in the service of the public good, which he set up in contradistinction to the 'secretists' and Paracelsian empirics who attempted to profit from clandestine remedies and panaceas.

Compared to the Paracelsians in his own time or near-contemporaries such as Jan Baptiste van Helmont (1580–1644), it is true that in both his rhetoric and practice, Sennert did not attempt as severe a break with tradition. When agreement with ancient learning was allowed by experience, 'the instructress of all things', he chose not to abandon Aristotle or Galen.⁹ Sennert clearly believed, however, that by thus emphasising experience and simply correcting the errors of the ancients, he was engaged in an audacious pursuit.

The chymical setting in Wittenberg

Prior to Sennert, it is clear that several Wittenberg academics had displayed interest in alchemy and chymical medicine by the mid-sixteenth century. Caspar Peucer owned multiple books on chymistry, including Pseudo-Geber's *Alchemiae Gebri Arabis*, Georg Agricola's *De re metallica*, and Pseudo-Raymond Lull's *De secretis naturae*.¹⁰ Martin Luther had spoken positively of alchemy, and Georg Joachim Rheticus (1514–1574) claimed to have met Paracelsus and was clearly interested in his understanding of chymical medicine.¹¹ Even the Danish polymath Tycho Brahe (1546–1601) spent six months at Wittenberg in the house of Sennert's teacher, Johannes Jessenius (1566–1621), while Sennert was a student at the university, and Tycho noted that he had set up a laboratory during his stay.¹² In short, awareness and interest in alchemy and chymistry was not novel in Wittenberg during Sennert's time as a student.

Among the first textual evidence of Sennert's serious interest in chymistry are several disputations written between 1607 and 1609.¹³ By 1611, Sennert had extensively expanded his chymical repertoire and included a long section on chymistry and chymical medicines within his *Institutiones medicinae*.¹⁴ It is still unclear precisely from whom Sennert first learned chymical practice, and while there is not a complete picture of the sources from which he drew, it is clear that by the 1611 publication of the *Institutiones*, Sennert was familiar with the works of such chymical authors as Georg Agricola (1494–1555), Andreas Libavius (c. 1555–1616), Pseudo-Geber (13th c.), and Albertus Magnus (d. 1280).¹⁵

It appears that it was in 1616, just several years after Sennert's publication of his *Institutiones*, that he first offered his *collegium chymicum* from his own home.¹⁶

Sennert referred to different iterations of this course in letters from 1619 and 1623, and Hans Anderson Skovgaard wrote of the 1623 course to his teacher, the Danish physician Ole Worm (1588–1655).¹⁷ According to Skovgaard, the only prominent sources of chymical instruction at this time in Germany were Sennert and Johann Hartmann (1568–1631), Professor of Chymiatría at Marburg.¹⁸ However, whereas Hartmann apparently charged students large sums to learn the secrets of chymistry, Sennert only asked ten thalers per student – an amount which Worm judged to be entirely equitable – and instead of esoteric secrets, he focused on practical processes.¹⁹ The Danish professor Caspar Bartholin (1585–1629) echoed Worm’s sentiments and suggested that students travel to Wittenberg to learn chymical pharmaceuticals from Sennert.²⁰ In light of these recommendations from Danish luminaries, it appears that Sennert’s understanding of chymical medicine as presented in his works and at his *collegium* had a particularly important influence in Scandinavia and northern German territories.²¹

The chymico-atomical reform of medicine

By the year 1623, Sennert was particularly displeased with the state of both medicine and natural philosophy, and he believed he had a potential solution. In the midst of his normal professorial duties and the plodding Thirty Years’ War, Sennert wrote to his brother-in-law and former student, Michael Döring (d. 1644), who had been and would continue to be his closest epistolary confidante:

I judge now, having been taught by experience, that our medicine, the whole of which is supported by Natural Philosophy [*Physicae*], is lacking, and a majority of it is supported by dubious principles. I do not have the leisure to prove anything in this matter. But I am astonished at how carelessly this thing, to which this province is committed, is done, as if nothing can be of doubt in nature . . .²²

Sennert complained that most physicians and philosophers were complacent in their overconfidence in tradition, and he made clear the several remedies he believed would restore medicine and natural philosophy, writing:

However, I plainly cannot put aside the care of atoms and the *syncrisis* and *diacrisis* of Democritus; and I entirely believe that injury has been done to that most diligent student of the nature of things by Aristotle, since the Interpreters of Aristotle have ordered us to deduce everything from first qualities, and have mired us in the most dense muck of ignorance, from which we are only barely able to extract our feet. If I were able to withdraw from other duties for at least one month, I would furnish a work in order to exhibit Democritus restored, not without, as I hope, making it fit for posterity.²³

In considering the legacy he would leave, Sennert implored his protégé that he give special attention to one area of their shared endeavour, writing, ‘And I wish this, that you do not abandon the care of Chymical medicaments’.²⁴ In the escalating upheaval between scholastic physicians loyal to a particular interpretation of Aristotle and Galen, and those who critiqued such ancient authors, Sennert believed that chymical medicines were to play a central role in the conflict. Sennert noted that as the lines of battle had been drawn, the number of physicians of a mind similar to Döring and himself in this matter was growing ever larger, especially among ‘the younger physicians from the teaching of [Johannes] Hartmann, who discuss nothing unless it is Chymical.’²⁵ He thus concluded the letter asking that Döring and his like-minded colleagues keep watch for Galenist attacks and warn Sennert when they were imminent.

Sennert’s rhetoric here inflects the common portrayal of him as a conciliator between Paracelsianism and traditional Aristotelianism.²⁶ That Sennert was a conciliator is surely true, but this does not capture the complexity of Sennert’s natural philosophy and medicine, nor the extent to which his thought diverged from both of these groups. In short, Sennert’s adoption of experimental chymistry, his embrace of a vision of ancient authority that was largely distinct from his scholastic forebears, and his acceptance of certain novel views promoted by earlier sixteenth-century physicians meant large changes for medicine.

Chymical and occult diseases and remedies

Sennert’s 1607–1609 disputations contained his first serious – albeit brief – treatment of chymical medicines and chymical operations, and was full of major concepts that would set the tenor for his mature natural-philosophical and medical *oeuvre*, including his understanding of the generation and action of poisons, the causes of occult diseases like rabies, and so-called diseases of the whole substance. Sennert’s discussion of chymistry here was closely coupled with tartar, a substance that was known to the ancients, extensively used throughout medieval alchemy, but especially significant in medicine following Paracelsus von Hohenheim’s (1493–1541) claim that a large group of diseases resulted from the ingestion of the substance.²⁷ These maladies ranged from gout and arthritis to sciatica and kidney stones. The notion that an exogenous and concrete entity was the proximate cause of such diseases was far different from the Galenic notion of an imbalance of the humors, but Sennert argued, for instance, that the Paracelsian conception of a tartar that caused kidney stones was nearly identical to the ‘salt and sharp juice’ of Felix Plater (1536–1614) and the ‘stone-forming juice’ of Pietro Andrea Mattioli (1501–1577).²⁸ Sennert also supported his understanding of tartarous disease by appealing to the chymistry of salts in solution, siding with the chymists that salts were ‘really [*revera*] in things and separable by the chymical art’, and not mere artifacts of whatever chymical process had been used to separate them from their mixture.²⁹ Tartar, Sennert concluded, was simply expelled from wine and coagulated according to its own

nature on the walls of wine barrels, and drinking wines that contained more tartar would thus lead to diseases like gout and kidney stones.³⁰ While Sennert did not use tartar as a proof of atomism in these early disputations, he did just this in his 1636 *Hypomnemata Physica*, writing, ‘Certainly plants manifestly exhibit atoms. For who would believe that stony tartar and calcareous matter were in clear and transparent wine unless it appeared by *diacrisis* . . . ?’³¹

By 1619, Sennert had much expanded his understanding of chymical pathology, and included an entire chapter on the subject in his *De Chymicorum*. Sennert flatly rejected the Paracelsian understanding of ‘seeds of disease’, or actual disease entities, for these smacked of Manichaeism and would make God the author of evil and disease, whereas Sennert’s Lutheran theology held that evil was accidentally, rather than consubstantially linked with matter.³² Sennert did, however, accept the Paracelsian principles Salt, Sulphur, and Mercury, arguing that these were the *prima mixta*, or first mixts of the four elements, and that they played an important role in disease and medicine.³³ These *prima mixta* were closely coupled with a new understanding of the bodily humors, which Sennert had gleaned from various Hippocratic texts. Sennert argued on the basis of Hippocratic authority that salts were truly and heterogeneously in salty humors, and he referred throughout his text to several passages that described the humors as tastes.³⁴ Sennert quoted from *De natura hominis*, where the ancient author had written that plants not only attracted ‘heat, cold, wet, dry, or what was mixed from them *simpliciter*’, but rather, ‘each one attracts whatever is familiar to itself in the earth, which however is acid, bitter, sweet, salty, and every other kind’.³⁵ Sennert explained his view of the humors more explicitly in a new chapter added to the 1620 *Institutiones*, where he wrote:

Even if the humors are not to be rejected insofar as experience shows them to be causes of disease, they ought not, nonetheless, be defined only by their first qualities, for although many diseases are able to be excited by hotness, coldness, wetness, and dryness, many other qualities, however, are discovered, which are able to harm the body not less, but more than the first qualities.³⁶

Sennert once again invoked the Hippocratic tastes and the powers of ingested tartar and salts to act in these humors, arguing that these were not to be understood ‘as if they only had a certain analogy to those [salts] . . . but really contain in themselves particular salts’.³⁷ By the 1629 publication of the second edition of *De Chymicorum*, Sennert had noted his general agreement with the chymists, who explicitly equated the Hippocratean tastes with Salt, Sulphur, and Mercury, and by adopting these, Sennert was thus able to explain a large variety of phenomena in medicine and nature without recourse to the elements or sensible qualities, but stopping far short of rejecting these altogether.³⁸

In 1631, Sennert published a treatise titled *De arthritide*, which he included as an appendix to the third volume of the *Practica medicina*.³⁹ In using the term *arthritis*, Sennert did not refer only to the pains of the joints which

modern medicine would recognise as arthritis, but rather primarily to gout, and his general objective in this work was to demonstrate how chymical substances with chymical qualities could cause disease. Sennert argued that gout pains were not merely caused by the pressure of distension caused by humors, but by the 'puncturing and pricking' action of a 'salty and sharp humor . . . the chymists call tartarous', which collected in the sensitive parts about the joint.⁴⁰ This humor was of 'an altogether particular nature' and was composed from the aliment which plants attracted from the earth, and thus it was a substance entirely separate from other humors which caused different inflammations or pains throughout the body. Sennert recounted the opinions of the chymists, who believed that tartar was not simple, like Salt, but instead composed of Earth, Salt, and Sulphur, and that these three in various mixtures led to different tartarous substances which could all be ingested and lead to gout.⁴¹ Such salty or mineral humors seemed an especially likely candidate for the primary cause of this disease, as it had long been observed that individuals accustomed to drinking copious amounts of wine were especially prone to gout.

The fact that gout was often observed to be epidemical was further proof for Sennert that it resulted from an environmental impurity in food and drink. He noted, moreover, that those regions beset by tartarous gout were also often subject to the widespread incidence of diseases related to tartar, such as kidney stones, colic, the palsy, and epilepsy.⁴² Most individuals, however, were not affected by the presence of tartar in their diet, for their bodies were able to eliminate such compounds in the first or second concoction in digestion, thus explaining why not all drunkards were harassed by gout pains. For those unlucky enough to have defective faculties of concoction, the tartarous matter was taken into the blood and thrust by the body in every direction, eventually precipitating in the joints of the extremities.

The question of why this humor coagulated in the joints rather than in diverse parts of the body was difficult to answer, and thus Sennert offered a likely but not conclusive 'paradox', leaving readers to draw their own conclusions.⁴³ Seeing as blood was not homogenous, and that the thicker parts nourished bones, while the more subtle parts nourished the lungs, Sennert deduced that this must occur through some form of sympathetic affinity or attraction.⁴⁴ He wrote:

I also think I am rightly able to assert that the humor causing the gout has a certain familiarity and affinity with the bones, but to be adverse to the membranous parts, if not in an occult manner, nevertheless by acrimony and a pricking and lancing faculty. For it is very probable, as the bones, ligaments, and tendons are nourished by a more earthy blood and have an affinity with the tartarous humor, and both the crass as well as the subtle tartarous humors, are thrust principally to the extremities rather than the other parts, because Nature, as much as it is able, tries to force the vicious humors from the principal parts to the most remote parts.⁴⁵

In an appendix to this treatise Sennert returned to the question of whether the cause of gout was an occult quality or rather a chymical quality. Sennert argued that there was no ‘no need that we have recourse to an occult quality or peculiar malignity’, for it was evident that arthritic pains proceeded directly from the acrimony [*acrimonia*] of the tartarous humor, that is, its corrosive chymical quality.⁴⁶ Just as *aqua regia* by nature had a corrosive quality which dissolved gold, so too the tartarous humor had an innate quality that allowed it to penetrate the joints and cause pain by pricking or eating away at the sensitive parts.

Sennert’s explanation of this disease by chymical qualities was partially based on several chymical experiments that he and Döring had discussed at length in correspondence. The two agreed that while medicines were not to be spurned as a treatment for gout, the best hope was in altering the diet, and most importantly, avoiding wines rich with tartar.⁴⁷ If one’s digestion would not allow complete abstention from wine, Sennert recommended drinking Rhenish wines, for these and their like were believed to contain less tartar.⁴⁸ Döring responded, however, that while he also had believed this, someone had corrected him in a previous year, and had informed him of a ‘test [*examen*]’ that had been ordered by Abraham von Dohna (1561–1613), the Burggrave of Dohna and a Silesian noble in service to Holy Roman Emperor Rudolf II (1552–1612). The test had been carried out by a certain Lesch (*Leschius*), the report had been sealed by the hand of one Christopher Scholtz, and it consisted of the distillation of various wines to determine the different amounts of tartar.⁴⁹ Döring recounted the unexpected results, which showed that twenty-four measures of Rhenish wine yielded nearly three ounces of tartar, while Hungarian Tokaji wine (i.e. *Tokavensian* wine), which was known to be much stronger, scarcely yielded two drams.⁵⁰ The outcome of the distillation thus required an explanation.

Döring suggested that the phenomenon could be explained if the tartar in the Tokaji wine was carried over in its distillation because of its greater amount of alcohol.⁵¹ In his response, Sennert communicated his assent, noting that tartar was in wine both in fixed and volatile form, and when volatile, its parts were ‘mixed *per minima*’ with the other parts of the wine.⁵² In his discussion of this experiment in *De Arthritide*, Sennert explicitly concluded that it in no way contradicted his opinion that certain wines caused gout more so than others, writing:

For those [Rhenish] wines have salt or tartar only superficially, as I thus say, and in a thick manner mingled together with them, or as the chymists say, as yet a fixed salt. These [Tokaji wines], however, have a volatile salt or tartar most exactly mixed, so that it is made just as if spiritual . . .⁵³

Sennert supported this conclusion by proffering several more chymical experiments. He argued that the distillations of the chymists readily showed that fixed salts could easily be made volatile and ‘ascend the alembic’, a phenomenon that was clearly observed in the creation of so-called tartarised spirit of wine.⁵⁴

Tartarising the spirit of wine referred to the process in which one distilled a mixture of salt of tartar with spirit of wine to yield an even stronger spirit of wine – an operation that was similar in effect to the modern process of ‘salting out’ the water from ethanol using potassium carbonate.⁵⁵ Many early-modern chymists noted, however, that after this distillation, a certain amount of the solid, tartarous substance was observed in the receiver. The influential pseudonymous author Basil Valentine (c. 1565–1624), for instance, described this experiment, even explaining the phenomenon by a proto-affinity theory. He wrote, ‘... the Spirit of Tartar is opened by the Spirit of Wine, and then they wonderfully make love [*sie lieben sich wunderbar*], and it comes over with the Spirit of Wine and is united with it’.⁵⁶ Sennert noted another experiment that he believed to illustrate a similar conclusion, writing, ‘Indeed, metals also are able thus to be dissolved in strong acids and spirits, that not only do they pass through a card, but are elevated into the alembic’.⁵⁷ Such volatilizations were strongly suggestive for Sennert that a volatile salt in tartar was responsible for the gout, and that it was, in fact, during the process of concoction both in plants and humans that the salt was made especially volatile.⁵⁸

In his *Paralipomena*, Sennert added a section to *De Arthritide* and wrote at greater length on this and other experiments, explicitly concluding that tartar was composed ‘from a fixed and volatile salt [*ex sale fixo & volatili*] and an earth’ and that the volatilized tartar was the primary cause of gout, for it was ‘altogether in the nature of salts that they reduce other bodies into the smallest atoms and then associate them to themselves’.⁵⁹ Sennert concluded his thoughts here by suggesting that it was in hot regions that tartarous atoms could be more closely mixed with atoms of the spirit of wine, and as before, that stronger wines had a greater affinity for atoms of tartar and were therefore more dangerous to those prone to gout.⁶⁰

While Sennert agreed that the best hope for curing the gout was in a correct diet and avoiding strong wines, he still discussed and advocated a large variety of pharmaceutical treatments. He advocated traditional cures such as the use of blood-letting to reduce offending humors, or narcotics for palliative care, but believed that the primary method of medicinal treatment was to be directed at dissolving the tartarous humor and removing it from the body. He wrote:

Our primary concern ought to be this, that the serous and sharp humor, which is the nearest and most principal cause of pain, can be drawn from the parts of the interior joints to the exterior parts, and insensibly dissipated ...⁶¹

Following the ancient homeopathic principle that ‘like cures like’, Sennert advocated the use of medicaments that were similar to the cause of the disease. The most proximate cause of the gout was a volatile salt, so Sennert recommended medicines containing volatile salts, such as sublimated *sal ammoniac*. After these volatile salts had been dissolved by such medicines, the body could

either naturally expel them by the power of the excretive faculty, or this process could be hastened by administering other purgatives.

Beyond diseases caused primarily by chymical substances and their offending qualities, another chief group of causes which Sennert called upon over the course of his career were occult qualities.⁶² Sennert followed Jean Fernel (1497–1558) in identifying the action of adverse occult qualities taken into or generated by the body with diseases of the whole substance, a category which included a variety of maladies, including diseases caused by poison or venom, and contagious diseases like phthisis, plague, or venereal disease.⁶³ Diseases of the whole substance affected the entire body and could not be explained simply by the elements or sensible qualities, for while they were most often caused by a very small amount of matter, their effects in the body were extensive and powerful enough that they demanded explanation by stronger qualities. In his mature writings, Sennert devoted an entire volume of his *Practica Medicina* to occult diseases, and an entire *Hypomnema* in his *Hypomnemata Physica* to occult qualities.⁶⁴ While the Wittenberg professor believed that such diseases could not be explained strictly by a chymical quality, chymical atomism still played an important role both in explaining further the causes of these diseases and determining which treatments were most likely to be successful, but also the reasons why certain treatments had the capacity themselves to cause serious harm.

The occult disease which Sennert wrote about the most extensively in his 1635 *Practica Medicina* was venereal disease [*lues venerea*], which probably included syphilis and a variety of other disorders.⁶⁵ Sennert's discussion of venereal disease drew from a wide variety of sources, including major figures such as Girolamo Fracastoro (c. 1476–1553), Franciscus Vallesius (1524–1592), and Gabriele Falloppio (1523–1562), but the individual with whom he appears to have agreed the most was a figure who has been largely forgotten by the history of medicine: Giovanni Tommaso Minadous (1554–1604), a professor at Padua, who had been one of William Harvey's professors, and who also authored a number of medical texts, including the 1596 *Tractatus de Virulentia Venerea*.⁶⁶ Minadous had been influenced by the revival of Lucretian atomism, and he thus argued that the venereal disease was transferred by a body rather than a quality, for as he quoted the Roman poet, 'Nothing is able to touch or be touched unless it is a body'.⁶⁷ Sennert concurred with the notion that the disease must be transferred corporeally, but disagreed with Minadous's conclusion that the venereal disease was merely a body or an 'external error', and not a disease *per se*.⁶⁸ In defining the disease thusly, Sennert argued that Minadous 'confuses the cause and the disease', for the minute bodies carrying the occult quality were strictly the cause of the disease, and not the disease itself.⁶⁹ Despite this mistake, however, Sennert noted that if one simply considered as the cause what Minadous had for the disease, one would be close to the truth, for the Paduan author still maintained that it was a corporeal vapour endowed with an occult and malignant quality that was inimical to the natural faculty and changed both the humors and the living parts into its own corrupt likeness.⁷⁰

Regarding his agreement with this partially redacted understanding of Minadous, Sennert wrote:

But whereas he says the venereal disease – being accepted as the cause – is a vapor or spirit, it is rightly to be accepted. Certainly in no way is it to be denied that it is also a humor, for in copulation it is rubbed on the body and adheres to the clothes. But such is its nature, that although it is resolved into vapors and the smallest corpuscles, each one of these, however, contains its whole essence, and has the power of affecting others.⁷¹

In short, Sennert agreed on almost every point with Minadous, and argued that if he had only logically followed through with his argument, he would not have confused the cause with the disease.

Regarding the cure of this disease, Sennert reasoned that because it was caused by an occult quality, it was best treated by medicines that likewise worked by occult qualities, and namely so-called *alexipharmaca* or *alexiteria*, which were most often used for resisting poisons.⁷² As Sennert argued further, ‘because this disease is occult, and known only by its effects, so too the remedies which cure this disease are not discovered by reason, but only by experience’.⁷³ The remedies that had thus far been demonstrated by experience to be efficacious and able to ‘pull up the very root of the disease’ were Sarsaparilla, so-called China Root, Sassafras, but most importantly, Guaiacum.⁷⁴ While Sennert believed that Guaiacum and its fellow alexipharmics did partially purge the body, this alone did little to cure the disease, and instead they worked first by directly resisting the occult quality within the ‘Venereal Virulency’, but also by strengthening the body’s radical moisture or, as the chymists called it, the ‘Natural Balsam’.⁷⁵ With regard to treating venereal disease by Guaiacum, Sennert noted that it sometimes strengthened the radical moisture to such a degree that not only was health restored, but the nutritive faculty was so enhanced that the patient became more corpulent and healthy than before the disease.⁷⁶

Sennert also addressed the common but controversial treatment for venereal disease: metallic mercury. Whereas some physicians argued that mercury was useful against the venereal disease by virtue of its elemental and sensible qualities, or on account of one substance within its heterogeneous mixture, Sennert noted that mercury could not work in such ways, for no matter what chymical process was applied, it always remained homogenous, perfectly mixed mercury, and even if ‘reduced to atoms’, each atom retained the ‘whole nature and essence’ of mercury.⁷⁷ As to whether mercury should be used to treat venereal disease, Sennert argued that the experience of physicians was not conclusive, and there were too many conflicting reports to arrive at certainty. Sennert challenged those who believed that mercury was *alexipharmic*, for even metallic mercury was observed by many to have an occult quality that did not help the body, but rather attacked the brain and the nerves.⁷⁸ If ingested or topically applied in its common, metallic state, it often simply passed through the

body and was excreted with the stool, but if, for example, mercury sublimate or mercury precipitate were used, these compounds, 'because they are resolved into the smallest bodies, and being mixed with salts can adhere to the body, by the benefit of things mixed, most intimately insinuate themselves into it'.⁷⁹ Resolved mercury thus not only could carry out its effects in the body *per minima*, but on account of its affinity for salts, it was doubly penetrative and dangerous. That this was true was further attested by autopsies of syphilitic patients treated with such mercuric remedies, as they revealed deposits of mercury deep within the body, and most notably, within the cavities of bones.⁸⁰ Sennert thus followed the judgement given by Wilhelm Fabry (1560–1634) in a letter to Döring, that the effects of the use of mercury sublimate or precipitate were often much worse than the disease itself.⁸¹ Contrary to many Paracelsian chymists, Sennert concluded that compounds containing mercury were only to be used very carefully and as a last resort in advanced stages of disease when other remedies – namely, Guaiacum – had been used and found wanting. To the question of how mercury was helpful in these extreme cases, Sennert responded that it was surely not an *alexipharmic* quality, and that its efficacy was rather situated in its power to purge the body most violently through evacuating vomit, stool, sweat, and saliva. He thus considered that it ought to be numbered among the 'evacuating medicines', which were useful for violently purging humors in especially obstinate cases.⁸²

Sennert's explanation for how such purgatives worked is illustrative of the diverse humoral, occult, and chymical forces at work in his medicine. Sennert was largely following the work of Laurent Joubert (1529–1583), Jean Fernel, and Thomas Erastus, who all had challenged the notion that purgatives worked strictly by attracting a specific humor.⁸³ These authors had variant ways of challenging this doctrine, but all agreed that some kind of non-specific irritation was at work, for instance, as Erastus argued, that these medicines purged 'because they are troublesome to Nature, either because of their quality or quantity, or their whole nature: and thus excite Her to expel whatever is fit to be purged'.⁸⁴ Sennert maintained a place for both the irritation of the expulsive faculty and the specific action of particular purgatives.⁸⁵ He argued that these drugs were deduced into action by heat of the body, resolved into spirits, and dispersed throughout the body where they moved the humors with which they had an affinity 'by a certain occult force and property', but that they also purged by separating the humors from the blood, which stimulated nature to expel both the vicious humors and the purging medicine by the power of the expulsive faculty.⁸⁶ In the 1628 edition of the *Institutiones*, Sennert modified this text so that that these drugs not only 'move' the noxious humors, but 'ferment [*fermentant*]' them, and this was the means by which they were separated from the blood before being expelled.⁸⁷ Such notions of fermentation came to be especially influential throughout the seventeenth and eighteenth centuries on the physiological, medical, and chymical doctrines of individuals such as Anton Günther Billich (1598–1640), Van Helmont, Thomas Willis (1621–1675), and Georg Ernst Stahl (1659–1734), but of course, Sennert was by no means the only source of such ideas.⁸⁸

Conclusion: experience and the effects of the reform

In Döring's final letter to Sennert, which was written just one month before Sennert died of the plague, he began by writing that just as Virgil had one once lamented that 'now I have forgotten so many songs', so too he could safely say the same thing of 'all these controversies, whether they be philosophical or medico-theoretical'.⁸⁹ By the end of his career, Sennert had been successful in aggravating a number of those physicians and natural philosophers devoted to the perpetuation of a particular, traditional interpretation of Aristotle and Galen. Döring wrote this while Sennert was in the midst of his long controversy with Johann Freitag, but there was an earlier controversy that is especially helpful for illustrating the effects of Sennert's reform of chymical medicine. Sennert had been especially irritated when the famous physician and botanist Caspar Bauhin (1560–1624) had severely criticised him for his support of chymical medicaments – and namely *Bezoardicum Minerale* – in his 1611 *Institutiones*.⁹⁰ As he was preparing to publish the second edition of this text, Sennert wrote to Döring, 'For although I know that all these things will be most acceptable to the chymists, I dread, however, the judgment of certain Galenists . . .'⁹¹ Thus, in a new preface to the 1620 edition, Sennert set about defending the use of chymical medicines against these same individuals, and it was clear that he had Bauhin in mind.⁹² Sennert defended the use of mercury in medicine, asking if there was anyone 'among learned men' who rejected it, and he argued, moreover, that similar herbal *drastichotera* [δραστικώτερα] (i.e. medicines prescribed only as a last resort) had been used throughout ancient medicine, and these were not much different in effect from chymical and mineral medicines.⁹³

On the other hand, Sennert harshly criticised those chymical *thaumaturgoi* [θαυματουργοί], or wonderworkers, who claimed to be able to heal all diseases with the use of only mineral medicines.⁹⁴ Insofar as these mostly unlearned empirics trumpeted the wonders of their own medicines and inflated their renown with 'great and glorious inscriptions and advertisements', Sennert wrote that they were not unlike the boastful cook from Plautus's *Pseudolus* who claimed not only that his repasts were magical and able to extend life up to two hundred years, but that all other cooks merely using seasoned vegetables were tantamount to poisoners.⁹⁵ Sennert wrote, however, that he was not so credulous as to be taken in by these chymical bloviations. Directly quoting Cleareta, another of Plautus's characters from a different play, Sennert continued, writing, 'Our hands have eyes in them, they believe what they see'.⁹⁶ In short, Sennert's claim that he was not credulous was mediated by experience of the observable. In effect, the great claims of the chymists about their medicines would have to stand the tests of experience and experiment understood within the context of natural philosophy and learned medicine.

Sennert thus sought a middle way between the inflexible Galenists and the impetuous Paracelsian empirics. He described this compromise and the solution he proposed as follows:

And it would be an altogether beautiful harmony if what the Italians have done in the method of healing and in the diligent accuracy in the

Indications were prudently combined with the experiments and elegant and efficacious medicaments of the Germans.⁹⁷

This style of medicine would thus be ruled by experience and open to any chymical medicines that were supported by experiment, but such medicines would have to be explained and used according to the principles of rational medicine as these were theorised and practiced by the most renowned of the Italian schools of medicine. Sennert's praise of Italian medicine and German experimental medicine appears to have been a slight directed at Bauhin, for Sennert elsewhere complained to Döring that Bauhin only recommended French physicians and condemned those from Germany and Italy.⁹⁸ Sennert expressed a similar idea in 1623 in correspondence with Döring and wrote that he often desired 'the better supplies and choice of medicaments of the Italians', and thus wanted to incorporate these into German medicine, but that an equally difficult problem seemed pressing in that there was no systematic relationship between the use of medicaments and the causes or indications of a disease.⁹⁹ As Sennert described the problem, if twenty physicians were called to a patient, twenty different treatments would be prescribed. Nevertheless, it is clear that Sennert believed German chymical medicine was unique by virtue of its emphasis on experience and experiments.

In response to a related problem, Sennert argued that the chymists' and empirics' grandiloquent descriptions of their cures and panaceas would henceforth need to be moderated and made to comport with the composition of a medicine itself and its actions within the humors of the body. Although the unlearned empirics might have skill in their chymical anatomies, Sennert argued that these lacked a basic understanding of rational and erudite medicine.¹⁰⁰ This did not mean, however, that Sennert entirely rejected empiric remedies or even medicines purported to act in some universal fashion, but he maintained that these had to be explained by rational medicine.¹⁰¹ Sennert argued that the empirics also erred especially grievously in their use of secrecy to profit from their remedies, and thus he regularly railed against them on religious grounds, appealing to the parable of the talents and arguing that they had betrayed their calling as physicians to serve the public good.¹⁰² In correspondence, Döring often echoed these claims, writing, for instance, regarding the empirics, 'Woe to the man, as the Scripture says, who buries under the earth the talent entrusted to him by God and does not earn interest for the public good!'¹⁰³ In effect, both Sennert and Döring believed that chymical medicine would be reformed by greater openness rooted in Christian charity.

Sennert's statements here and his explanations of the causes of disease and the actions of medicines in gout and venereal disease capture well his desire for reform. His atomic chymistry and interest in the dissolving of salts was combined with an updated Hippocratic reinterpretation of the humors as well as a belief that some diseases and medicines acted beyond the power of the elements, and instead worked by their whole substance. These forces joined to give rise to an explicitly chymical understanding of pathology and therapy

in the case of the gout. Likewise, although the causes of venereal disease were occult, Sennert still explained the contagious nature of the disease through his atomism. He also justified the use of prepared mercurial chymical medicines in drastic cases by explaining their ability to violently purge through reference to atomic actions *per minima* within the body. In effect, it is not only the case that Sennert's atomism *per se* was radical, but his particular combination of learned medicine with chymical medicaments and experimental atomism shared a similar reformist vision.

While Sennert was clearly the beneficiary of the Melanchthonian emphasis on Aristotle in natural philosophy, the Lutheran view of the traducianist propagation or multiplication of souls, and Lutheran notions of the public good in relation to the open use of medicaments, the further influence of Melanchthon and his immediate successors is not particularly apparent in Sennert's works or letters. Peucer's interest in chymistry is especially interesting, but Sennert rarely referred to either Peucer or Melanchthon, and as Craig Martin has argued with reference to Sennert's meteorological works, he did not discuss teleology or final causes in a similar fashion as his ancestors in Wittenberg, and instead attributed meteorological phenomena primarily to natural causes.¹⁰⁴ A similar emphasis on natural causes is evident in Sennert's medicine. While the extent of the influence of Sennert's chymico-atomical reform of medicine is not yet clear, it appears that his pedagogy regarding chymical pharmacy was especially important in Scandinavian and northern German territories – Lutheran regions from which many students chose to study at Wittenberg.

Notes

- 1 William R. Newman, *Atoms and Alchemy: Chymistry and the Experimental Origins of the Scientific Revolution* (Chicago, 2006).
- 2 See Emily Michael, 'Sennert's Sea Change: Atoms and Causes', in Christoph Lüthy, John E. Murdoch and William R. Newman (eds.), *Late Medieval and Early Modern Corpuscular Matter Theory* (Leiden, 2001), 338–339; Hiro Hirai, *Medical Humanism and Natural Philosophy: Renaissance Debates on Matter, Life and the Soul* (Leiden, 2011).
- 3 Newman, *Atoms and Alchemy*, 85–125.
- 4 See Sachiko Kusukawa, *The Transformation of Natural Philosophy: The Case of Philip Melanchthon* (Cambridge, 1995); Vivian Nutton, 'Wittenberg Anatomy', in Ole Peter Grell and Andrew Cunningham (eds.), *Medicine and Reformation* (New York, 1993), 11–32.
- 5 Tomáš Nejeschleba, 'The Theory of Sympathy and Antipathy in Wittenberg in the 16th Century', *Philosophica* 7 (2006), 82–89.
- 6 See Michael Stolberg, 'Particles of the Soul: The Medical and Lutheran Context of Daniel Sennert's Atomism', *Medicina Nei Secoli* 15, no. 2 (2003), 177–204.
- 7 Newman, *Atoms and Alchemy*, 157–215; Hans Kangro, *Joachim Jungius' Experimente und Gedanken zur Begründung der Chemie als Wissenschaft* (Wiesbaden, 1968).
- 8 Newman has recently discussed Sennert's theory of disease etiology in relation to his atomic understanding of vinegar formation. See William R. Newman, 'Elective Affinity before Geoffroy: Daniel Sennert's Atomistic Explanation of Vinous and Acetous Fermentation', in Gideon Manning (ed.), *Matter and Form in Early Modern Science and Philosophy* (Leiden, 2012), 101.
- 9 D. Sennert, *Hypomnemata Physica* (Frankfurt, 1636), 'Lectori Candido', n.p.

- 10 See Robert Kolb, *Caspar Peucer's Library: Portrait of a Wittenberg Professor of the Mid-Sixteenth Century* (St. Louis, 1976).
- 11 For Luther's praise of alchemy, see Tara Nummedal, 'Alchemy and Religion in Christian Europe', *Ambix* 60, no. 4 (2013), 311. On Rheticus's interest in Paracelsianism, see Karl Heinz Burmeister, *Georg Joachim Rheticus, 1514–1575*, vol. 1 (Wiesbaden, 1967), 35, 152–155.
- 12 See Victor E. Thoren, *The Lord of Uraniborg: A Biography of Tycho Brahe* (Cambridge, 1990), 405–407.
- 13 These were collected and published as Daniel Sennert, *Quaestiones Medicarum Controversarum* (Wittenberg, 1609).
- 14 Daniel Sennert, *Institutiones Medicinae* (Wittenberg, 1611), Book 5, Part 3.
- 15 Newman notes that Sennert referred to Pseudo-Geber at least eighteen times as a chymical authority in the fifty-six pages on chymistry within this text. Newman, *Atoms and Alchemy*, 89.
- 16 This claim is included in the preface to Georg Ernst Stahl, *Fundamenta Chymiae Dogmatico-Rationalis et Experimentalis*, Part 3 (Nuremberg, 1747), Praefatio. It is not clear who the author of this preface in this posthumously published volume was, and I have not seen it in previous editions.
- 17 See Ole Peter Grell, 'In Search of True Knowledge', in Pamela Smith and Benjamin Schmidt (eds.), *Making Knowledge in Early Modern Europe: Practices, Objects, and Texts, 1400–1800* (Chicago, 2007), 220.
- 18 While Sennert and Hartmann were the major sources of chymical instruction, there were other courses begun at around this same time. See Allen Debus, 'Chemistry and the Universities in the Seventeenth Century', *Estudos Avancados* 4 (1990), 176–196.
- 19 On the sums Hartmann charged, see Fritz Krafft, 'The Magic Word "Chymiatría" – and the Attractiveness of Medical Education at Marburg, 1608–1620: A Somewhat Different Reflection on Attendance', *History of Universities* 26 (2012), 28.
- 20 Jole Shackelford, *A Philosophical Path for Paracelsian Medicine: The Ideas, Intellectual Context, and Influence of Petrus Severinus (1540–1642)* (Copenhagen, 2004), 331.
- 21 Sennert also supervised other Danish students who had an important influence in Germany and abroad, including Simon Paulli (1603–1680).
- 22 Daniel Sennert to Michael Döring, 8 January 1623, *Epistolae Medicinalium*, in *Danielis Sennerti Vratislavenensis . . . operum in sex tomos divisorum*, vol. 6 (Lyon, 1676) Century 1, Letter 50, 589–590. Hereon I use 'C' and 'L'. 'Animadverto iam experientia edoctus, quid Medicinae nostrae, quae tota Physicae innititur, desit, & quam pleraque principiis dubiis innitantur. Ego in hac re ut aliquid tentem, otium non habeo. Miror verò quosdam quibus haec provincia commissa est, rem hanc tam negligenter agere, & quasi nihil dubii in natura sit. . . .'
- 23 Sennert to Döring, 1 February 1623, *Epistolae Medicinalium*, C.1. L.50, 590. 'Atomorum tamen & συγκρίσεως & διακρίσεως Democriticae curam planè deponere non possum; & omninò puto diligentissimo rerum naturae Scrutatori ab Aristotele factam injuriam, & Interpretes Aristotelis cùm omnia ex qualitatibus primis deducere non iusserunt, in densissimum ignorantiae lutum, nos demersisse, a quo vix pedes extrahere possumus. Si unum saltem mensem aliis negotiis subtrahere possem, darem operam, ut Democritum redivivum exhiberem, non sine, ut spero, posteritatis commodo'.
- 24 Ibid.
- 25 Ibid.
- 26 On Sennert as a conciliator, see Walter Pagel, *The Smiling Spleen: Paracelsianism in Storm and Stress* (Basel, 1983), 86; Allen Debus, *The Chemical Philosophy*, vol. 1 (New York, 1977), 202–204.
- 27 The material which collects on the inside of wine barrels is potassium bitartrate ($\text{KC}_4\text{H}_5\text{O}_6$), commonly known as *cream of tartar*. On Paracelsian tartar, see Walter Pagel, *Paracelsus: An Introduction to Philosophical Medicine in the Era of the Renaissance*, 2nd ed. (Basel, 1982), 153–161.

- 28 Sennert, *Quaestiones medicarum*, 110–111.
- 29 Ibid., 355.
- 30 Ibid., 357.
- 31 Sennert, *Hypomnemata Physica*, 112.
- 32 Sennert, *De Chymicorum* (Wittenberg, 1619), 453–456.
- 33 Ibid., 294–295.
- 34 This understanding of the humors was not novel with Sennert. Evan Ragland traces further background of these tastes and discusses the influence of this Hippocratic tradition on Franciscus Sylvius's (1614–1672) use of taste in assaying chymical and physiological substances. See Evan Ragland, 'Chymistry and Taste in the Seventeenth Century: Franciscus Dele Boë Sylvius as a Chymical Physician between Galenism and Cartesianism', *Ambix* 59, no. 1 (2012), 1–21.
- 35 Sennert, *De Chymicorum*, 274–275.
- 36 Ibid., 218. ' . . . etsi humores, utpote quos ipsa experientia monstrat esse morborum causas, rejciendi non sint; tamen non solum qualitatibus primis definiri debent, & licet a caliditate, frigidity, humiditate, siccitate humorum multi morbi excitari possint: tamen plurimas adhuc alias qualitates in humoribus invenire est, quae non minus, quam primae qualitates, corpori nocere possunt'.
- 37 Sennert, *Institutiones*, 220.
- 38 Sennert, *De Chymicorum*, 142.
- 39 Daniel Sennert, *De Arthritide Tractatus* (Wittenberg, 1631).
- 40 Ibid., 10.
- 41 Ibid., 11.
- 42 Ibid., 12. On Sennert's understanding of poisons and epilepsy, see Andreas Blank, 'Daniel Sennert on Poisons, Epilepsy, and Subordinate Forms', *Perspectives on Science* 19, no. 2 (2011), 192–211.
- 43 Sennert, *De Arthritide*, 14.
- 44 Ibid.
- 45 Ibid., ' . . . etiam me recte statuere posse puto, humorem arthritidis causam familiaritatem aliquam, & naturae cognitionem habere cum ossibus, membranosis verò partibus esse adversum, si non occulto modo, acrimonia tamen & facultate vellicante ac lancinante. Verisimile enim est, cum ossa, ut & ligamenta, tendines, sanguine magis terrestri, & cum tartareo humore cognitionem habente alantur, alios etiam humores tartareos tam crassos, quam subtiles magis ad articulos, quam alias partes detrudi, & praecipue ad articulos partium extremarum; cum natura, quantum fieri potest, vitiosos humores à regis viis ad remotissimas partes propellere soleat'. Newman notes Sennert's use of *naturae cognatio* to describe Sennert's conception of affinity relations in the 1629 *De Chymicorum*, likewise arguing that Sennert used affinity relations to explain the etiology of scurvy. See Newman, 'Elective Affinity Before Geoffroy', 104, 119–124.
- 46 Ibid., 87.
- 47 Sennert and Döring's discussion of gout began in the first extant letter of the collection in Sennert's *Opera omnia*. See Sennert to Döring, 10 July 1619, *Epistolae Medicinalium*, C.1, L.1, 525.
- 48 Sennert to Döring, 25 August 1619, *Epistolae Medicinalium*, C.1, L.3, 527.
- 49 Döring to Sennert, 4 October 1619, *Epistolae Medicinalium*, C.1, L.4, 528.
- 50 Ibid. For further discussion, see Sennert, *De Arthritide*, 19–20.
- 51 Döring to Sennert, 4 October 1619, *Epistolae Medicinalium*, C.1, L.4, 528.
- 52 Sennert to Döring, 12 November 1619, *Epistolae Medicinalium*, C.1, L.7, 532.
- 53 Sennert, *De Arthritide*, 19–20. 'Habent enim illa salem illum seu tartarum superficialiter saltem, ut sic digam, & crasso modo commixtum; aut, ut cum Chymicis loquar, salem adhuc fixum; haec verò volatilem exatissime permixtum, ita ut sal illud & tartarum spirituosam quasi factum sit . . . '
- 54 Ibid., 20.

- 55 Adding potassium carbonate creates an aqueous phase that is immiscible with the alcohol phase which can be removed, yielding a higher concentrations of ethanol.
- 56 Basil Valentine, 'Hand-Griffe Fr. Basilius Valentini, Wie er seine Arzneyen gemacht', in *Chymischer Schriften, Dritter Theil* (Leipzig, 1769), 1091.
- 57 Sennert, *De Arthritide*, 20. For more on the significance of these experiments, see Newman, *Atoms and Alchemy*, 99–100, 122–123.
- 58 Ibid., 89.
- 59 Sennert, *Paralipomena*, 318.
- 60 Ibid., 319–320.
- 61 Sennert, *De Arthritide*, 40. '... praecipua cura esse debet, ut humor ille serosus & acris, qui proxima & principalis doloris causa est, à partibus in articulis penitioribus ad externas evocetur, & insensibiliter discutiatur ...'
- 62 On occult qualities, see John Henry, 'Occult Qualities and the Experimental Philosophy: Active Principles in Pre-Newtonian Matter Theory', *History of Science* 24 (1986), 335–381; Keith Hutchison, 'What Happened to Occult Qualities in the Scientific Revolution', *Isis* 73 (1982), 233–253.
- 63 Fernel modified Galen's notion of the whole substance, which had only been applied to certain drugs. See Jon Arrizabalaga, John Henderson, and Roger French, *The Great Pox: The French Disease in Renaissance Europe* (New Haven, 1997), 238–239. Fernel discussed these ideas extensively in Jean Fernel, *De Abditis Rerum Causa* (Venice, 1550).
- 64 Daniel Sennert, *Practica Medicina, De Morbis Occultis*, vol. 6 (Wittenberg, 1635); Sennert, *Hypomnemata Physica*, 43–85.
- 65 On the history of the term 'Syphilis' and the difficulty of determining the precise medical nature of the so-called French Disease, see Arrizabalaga, Henderson, and French, *The Great Pox*, 1–19.
- 66 Giovanni Tommaso Minadous, *Tractatus de Virulentia Venerea* (Venice: Meietus, 1596). Minadous signed his name 'Jo. Thomas Minadous Rhovigus' on William Harvey's diploma. See 'William Harvey's Diploma', *British Medical Journal* 2 (1908), 1700. In the *Tractatus*, however, he signed the dedicatory letter 'Aurelius Minadous'.
- 67 Minadous, *Tractatus de Virulentea Venerea*, 28–31. 'Tangere enim ac tangi nisi corpus nulla potest res'. The original quotation is from Lucretius, *De rerum natura*, I.304.
- 68 Sennert, *Practica Medicina, De Morbis Occultis*, 127, 130.
- 69 Ibid., 130.
- 70 Ibid., 127–130.
- 71 Ibid., 130. 'Quòd verò luem Veneream pro causa acceptam dicit esse vaporem, seu spiritum, id rectè accipiendum. Equidem nullo modo negari potest, quòd humor etiam sit, cùm nimirum in concubita corpori affricetur. Talis tamen ejus natura est, ut & aliorum contagiosorum humorum, ut, licet in vapores & minima corpuscula resolvatur; quodlibet tamen illorum totam ejus essentiam contineat, aliosque afficiendi vim habeat'.
- 72 Sennert has a chapter on these drugs in his *Institutiones Medicinae*, 853–855.
- 73 Sennert, *Practica Medicina, De Morbis Occultis*, 162.
- 74 Ibid., 164.
- 75 Ibid., 165.
- 76 Ibid.
- 77 Ibid., 187.
- 78 Ibid., 195–196.
- 79 Ibid., 188, 191–192.
- 80 Ibid., 200.
- 81 Ibid., 192.
- 82 Ibid., 196.
- 83 See Owsei Temkin, 'Fernel, Joubert and Erastus on the Specificity of Cathartic Drugs' in Allen Debus (ed.), *Science, Medicine and Society in the Renaissance* (London, 1972), 61–68.
- 84 Thomas Erastus, *De Occultis Pharmacorum Potestatibus* ... (Basel, 1574), quoted in Temkin, 'Fernel, Joubert, and Erastus', 515.

- 85 Sennert discussed the general action of purgatives in this regard at greatest length in a chapter of his *Institutiones* (in 1611 and in later editions) entitled, ‘De purgantibus per alvum’. Sennert, *Institutiones*, 836–847.
- 86 Ibid., 877.
- 87 Sennert, *Institutiones*, in *Danielis Sennerti . . . Operum*, vol. 2 (1676), 663. Sennert expressed this same idea in correspondence with Döring in 1622. Sennert to Döring, 16 August 1622, *Epistolae Medicinalium*, C.1, L.44, 579. Sennert wrote, ‘Purgantia neque electivè humores trahendo, neque solùm irritando purgationem instituere, puto, sed peculiarem quandam fermentationem in corpore ab iis excitari . . . & effervescentia quasi, humorum naturam irritatam expellere humores vitiosos, nunc per alvum, nunc per vomitum’.
- 88 See William Tammone, *Science in Ferment: The Doctrine of Fermentation in Seventeenth-Century British Science and Medicine* (PhD Dissertation, Indiana University, 1996).
- 89 Döring to Sennert, 4 June, 1637, *Epistolae Medicinalium*, C.2, L.99, 692.
- 90 Sennert to Döring, 25 August, 1619, *Epistolae Medicinalium*, C.1, L.3, 527.
- 91 Ibid.
- 92 Sennert, *Institutiones Medicinae*, b4r–c2v.
- 93 Ibid., b4v.
- 94 Ibid.
- 95 T. Maccius Plautus, *Plauti Comoediae*, ed. Fridericus Leo (Berlin, 1895), lines 790–838.
- 96 Ibid., C1r. For the source of this quote, see T. Maccius Plautus, ‘Asinaria’, in *M. Accii* (ed.), *Plauti Comoedia ex Editione J. F. Gronovii* (London, 1829), 174.
- 97 Sennert, *Institutiones Medicinae* (1620), c1v. ‘Et omnino pulchra harmonia est, si quis Italorum in methodo medendi atque Indicationibus accuratam diligentiam cum Germanorum experimentis, ac medicamentis elegantibus atque efficacibus prudenter conjugat’.
- 98 Sennert to Döring, 20 October 1623, *Epistolae Medicinalium*, C.1, L.60, 602.
- 99 Sennert to Döring, 6 June 1629, *Epistolae Medicinalium*, C.1, L.14, 543.
- 100 Sennert, *Institutiones Medicinae*, c1r.
- 101 I develop Sennert’s notion of ‘nearly-universal’ medicines at length in my dissertation, Joel A. Klein, *Chymical Medicine, Corpuscularism, and Controversy: A Study of Daniel Sennert’s Works and Letters* (PhD Dissertation, Indiana University, Bloomington, 2014).
- 102 For passages discussing the public good, see Sennert, *De Chymicorum*, 506; Sennert, *Paralipomena* (Wittenberg, 1642), 459–460.
- 103 Döring to Sennert, *Epistolae Medicinalium*, C.1., L.34, 561. Döring referred here to Matthew 25:14–30.
- 104 Craig Martin, *Renaissance Meteorology: Pomponazzi to Descartes* (Baltimore, 2011), 57–58.

4 The changing face of Lutheranism in post-Reformation Denmark

Rasmus H. C. Dreyer

Religious and educational reform

The Danish Reformation resulted in the introduction of a new Church Order in 1537, which not only changed the ecclesiastical structure, but also rearranged the educational system of the kingdom. The Danish reformers provided a draft for the new Church Order, but it was Johannes Bugenhagen, Luther's collaborator, who made sure that the Order had the Wittenberg imprint when published. The Instruction for the Visitors in Saxony served to shape the Danish Church Order's paragraphs on schools and education. The influence of Melancthon's humanist inspired thoughts and their practical execution is obvious. They, of course, overlapped with the views of the new leader of the Danish Lutheran Church, the Wittenberg-educated Peder Palladius.

The influence of the Saxony-instructions is striking; the relatively new regulations for the schools drafted by Christian II in 1522 did not mention classes, whereas the Saxony-instructions recommended a division of pupils into three classes. The ambitions in the Danish Church Order would appear to have been higher, but in reality proved identical: it recommended five classes in the larger cities, but in smaller market towns only three – occasionally four, if the school employed three teachers. In Peder Palladius' revised statutes for the schools, the so-called Tables of Uniformity accepted at the 1546 synod, Palladius changed this to two classes for the smaller towns. The curriculum remained the same, but the tally of classes or grades grew, ending with eight classes as prescribed in the 1656 Statutes, which followed the most significant changes to the Church Order of 1537, starting with the Statutes of 1604.¹ Even so, The Church Order of 1537 continued to function as the primary guideline for the school system until the end of the century.

The Church Order of 1539 decreed that every market town should have only one school. This stipulation of the provision of schools in the smaller towns did not signify that the old cathedral and chapter schools in the larger towns and cities – the Latin Schools – should be closed or cut back: 'For what would that be for a system?', as The Church Order asked rhetorically. Instead, 'we want the revival of these schools by the help of the superintendents, provosts, preachers and magistrates, so there may be several classes and increasingly

better education for the children than before'. As it did for Melanchthon and the Wittenberg reformers, education mattered for the Danish reformers, and the paragraphs on education are almost identical to Melanchthon's instructions for Saxony.

What did the curriculum offer? The teaching of the first grade was identical with Melanchthon's programme for the youngest scholars: they should learn the ABC (only mentioned in the Danish version of the Church Order of 1537), subsequently the Latin texts of the *Paternoster*, *Credo* and *The Ten Commandments*, and similar children's prayers. Two Latin words were suggested as the daily homework. Later on followed readings of Cato's moral sentences and Donatius's *Ars [grammatica] minor* – the fundamental grammar book throughout the Middle Ages until around 1600. Cato's moral distinctions were a typical humanist feature of the syllabus: it taught classical, antique ethics rather than any kind of reformed or Christian doctrine.

From the second until the fifth class, works by Melanchthon were prime reading. Every morning, the pupils started by reading Melanchthon's grammar and Aesop's fables, which illustrated the grammatical rules. Erasmus' *Colloquia Familiaria* and Mosselanus' *Pædologia* were the books used for Latin conversation. In the third class, this was amplified with Terentius, Plautus, Cicero, and in the fourth, with the poetry of Vergil and Ovid as well as exercises in Latin writing in both verse, prose, and letter-writing. By the end of the fourth, later the fifth, class, a Danish pupil should have reached the level expected by the end of the third year in Melanchthon's instructions for Saxon youths. Music and religion were the only non-linguistic disciplines in the schools; nevertheless, Melanchthon in his Instructions to Saxony warned against confusing school-children with too much reading in the Bible – and if read extensively, then only with the purpose of grammar in mind! An identical approach appears to have been taken in Denmark. Music, of course, was part of the daily religious practice of the Lutheran faith. Thus older pupils served as choirboys in the main churches every morning except Saturday, which was devoted to the reading of the catechism for the youngest and the study of Scripture for the oldest boys.

In the countryside, churches were more often than not used for catechism teaching and schooling. The local parish clerk acted as a teacher. The superintendent Peder Palladius describe what these Sunday sessions should be like in his Visitation Book: teaching was the parish clerk's 'supreme duty', and Palladius admonished the parishioners and parents to send their children to school primarily to prevent their children from a life of crime and subsequent death on the gallows. However, teaching and examination in the Danish catechism also provided an opportunity for the teacher and the minister to spot the clever boys who might be sent to the nearest Latin school for further education and later hope to attend the University in Copenhagen. Germany provided Palladius with a paradigm. He explained to the parishioners how the word of God had been preached to the Germans for much longer and proved its excellence in disciplining the children there. It had proved a success particularly in the market towns in Germany. According to Palladius, it should be imitated: 'God grant our

citizens in the market towns that they take this as an example to follow – it is about time and urgently needed'.²

Bearing in mind the number of existing schools and the reports on their standards from the visitations by the superintendents, it is evident that action was needed. The directions of the Church Order followed in the main and the number of schools increased gradually, yet in some of the smaller market towns schools were not opened until the beginning of the seventeenth century. The school in Slangerup in the centre of north Zealand was founded 1613, and in Nexø on the Island of Bornholm not until 1619.³

The oldest schools were the cathedral schools or Latin schools. These older and more advanced schools in the main cities of Denmark–Norway appear to have reached a relatively high level in Latin. They were expected to provide a higher level of education and provide their pupils with the ability to speak Latin at any time, during lessons as well as intervals, as was repeatedly emphasised. Greek and Hebrew was only taught at these major schools. The two languages of the Bible were considered the tongue of God, though Latin was still the primary idiom: 'The schoolteacher should primarily make sure that the children are taught Latin exclusively, not German or Greek or Hebrew', Melanchthon wrote in his Saxon regulations for schools from 1528. The Copenhagen schoolmaster, Olaus Theophilus, used similar words when in 1573 he explained why Latin eloquence and style was necessary to learn: Simply, because God cannot be recognised without it, and thus we would be condemned to perdition; the kingdom of the Devil is weakened and the salvation of souls assisted by the pursuit of the proper skills in Latin.⁴ In other words – Latin was a necessary part of religious life benefitting both the preaching of the Gospel and inquiries into Nature.

The scholarly standards were supposed to be the same for the smaller schools, yet the superintendents accepted a lower outcome. On Funen, the strict Philip-pist superintendent Jacob Madsen Vejle (1538–1606) inspected the schools as part of his visitations around 1600. In the town of Faaborg, the school had thirty pupils in 1601, all 'utterly lewd', the headmaster's three students could not write any Latin, he noted in his visitation book. Madsen Vejle examined the children in Latin grammar and translations from Danish. In 1595, in nearby Assens – one of the first towns in Denmark to embrace the Reformation – Madsen Vejle found the school in much better shape: 'The school had improved tremendously', he noted.⁵ The Oslo superintendent Niels Simonsen Glostrup (d. 1629) openly expressed his modest expectations of the teaching in the smaller schools. The schools performed well enough, he often stated, though only when their circumstances were taken into consideration, '*ratione sui status*', as he put it; in comparison with the leading Latin schools their trivium teaching and results were not up to much.

When youngsters had finished school, having completed the trivium, the lower three parts of the seven liberal arts, they could continue their studies at the University of Copenhagen. The University's lower quadrivium (arithmetic, geometry, music, and astronomy) was intended as a natural continuation of grammar, logic, and rhetoric, which they had been taught in school. The new

University Statutes of 1539 for the post-Reformation university and the first lecture list show the teaching of the liberal arts in Copenhagen as a continued study of Melanchthon's theoretical grammar. Initially only one professor in grammar was employed in Copenhagen, yet as early as 1545 another professor was appointed, resulting in the professors being named after the syllabus: the *Professors Terentianus* and *Vergilianus* – accordingly their teaching just continued the readings and lectures over the two most popular antique authors in the grammar schools. The new regulation and improvements of secondary schools from 1604 resulted in the abolishment of both Latin teaching and the grammar professorships at the University of Copenhagen in 1622. By then, the intentions of the 1604 school regulations and the gradual introduction of gymnasiums with their improved teaching from 1619, plus the effects of new textbooks, began to work. For the new gymnasiums the physician and theologian Casper Bartholin (1585–1629) wrote handbooks in logic, rhetoric, physics, ethics, and metaphysics; most of them edited versions of some of his earlier works. It is noteworthy that Caspar Bartholin distanced himself from the educational and philosophical approach of the Calvinist Peter Ramus, taking a similar position to that of Hans Poulsen Resen in works published a few years earlier.

Another major educational initiative of the early seventeenth century was the creation of the Royal Academy in Sorø. In 1586, the former Cistercian monastery in Sorø had been turned into a secondary school, but in 1623, King Christian IV elevated the school to an academy for young noblemen and turned it, at least in name, into a university (1623–1665). As opposed to the University of Copenhagen, the Academy was to educate students primarily in jurisprudence, history, and engineering. The lectures at the Academy were held in German, though Latin was used as well. Soon it also became possible for graduates from the Sorø Academy to become ministers in the church in line with bachelors from the University of Copenhagen. The Academy in Sorø clearly intended to offer a different educational route primarily aimed at noblemen who might want to serve the Crown as military officers and administrators – ⁶ as opposed to the University of Copenhagen which was primarily focussed on training future ministers for the church and physicians to serve the state's medical needs.

A reformed university

The University of Copenhagen, founded in 1479, had been closed down by the Catholic Bishop of Sealand in 1531 because it was seen as a hot-house of evangelical sedition. With the introduction of the Reformation the reformers petitioned the King to have the University reopened as a Protestant seat of learning. Christian III agreed, and on 17 September 1537, the University was refounded. In October lectures began in accordance with the lecture list drawn up by Johannes Bugenhagen and the new Vice-Chancellor, the Louvain-educated, Protestant, professor of medicine, Christian Torkelsen Morsing (a. 1485–1560).

Morsing, however, was no newcomer to the academic world. He had served as headmaster of the Cathedral school in Copenhagen and later as Vice-Chancellor

for the old university back in the 1520s.⁷ During the 1520s when the evangelical disturbances spread Morsing had left Copenhagen. He had travelled to Leipzig, Cologne, and finally Louvain. At Erasmus' university, he published a translation of a Greek book on cosmography and lectured on arithmetic and astronomy. He returned briefly to Copenhagen before he once more left his home country undertaking another *peregrinatio academica* in the 1530s, obtaining an MD from Basle. Shortly afterwards, he was recalled by King Christian III to become the first professor of medicine at the refounded University of Copenhagen. Morsing was able to shape the new study of medicine as the sole professor for ten years until 1547, when the Dutch, Wittenberg-educated, physician Peter Capiteyn (1511–1557) became *professor secundus*, simultaneously holding the post of Royal physician.

Christian Torkelsen Morsing died in 1560 surviving his first colleague in the medical faculty by three years. Capiteyn was succeeded by Hans Frandsen (1532–1584) in 1557. Frandsen was a pupil of the famous Tübingen botanist and physician, Leonhart Fuchs (1501–1566, who had refused the offer of the second professorship of medicine in Copenhagen. Frandsen was one of only a few Danish physicians from this period who did not receive their MDs in Basle, but in his case in France. Likewise, he preferred the ancient texts rather than the practical study. Yet the Swiss connection is noteworthy: seven of twelve professors of medicine in Copenhagen between 1537 and 1623 had their MD from Basle. Later on in the century, we know that the popularity of Wittenberg as the primary place for Danish students studying abroad was challenged by a high number, 567 students (out of a total of 1520) choosing Calvinist universities such as Basle, Franeker, Geneva, Herborn, and others as well as the Lutheran, though Ramist, University of Giessen.⁸

In Basle, the reformer Johannes Oecolampadius had reformed both church and university, including the study of medicine. Medicine was modelled on the ideas of Paracelsus (1493–1541), briefly professor and city-physician in Basle in 1527. Excluding Hans Frandsen, medicine as taught within the medical faculty in Basle proved hugely influential on the first two generations of professors of medicine in Copenhagen. Morsing intended that one of the professors in medicine in Copenhagen should teach practical medicine, while the other should lecture on the original Greek sources of theoretical medicine, using the texts of Hippocrates and Galen. Simultaneously, the study of anatomy was emphasised. Morsing's ideas for a reformed study of medicine (and with it the affiliated studies of Nature) were not dissimilar to Melanchthon's views despite Melanchthon's and Bugenhagen's adherence to the traditional curriculum in medicine, retaining Avicenna and Rhazes as compulsory reading. For Morsing, as well as Bugenhagen and Melanchthon, the university reform of the study of theology and medicine was an integral part of the Reformation. As Morsing put it in a preface to the Danish humanist Henrik Smith's herbal book in 1556:

And as Paul states, that among those chosen for the holy office of preacher, only few are powerfull and noble, similarly not many wealthy and mighty,

but only poor and simple people, are chosen to become physicians, thereby serving Man's bodily needs, as his soul is served through the preaching of the Gospel.⁹

Morsing's ambitions were not fully incorporated in Bugenhagen's Statutes of 1539 for the University of Copenhagen, but knowledge of both God and his most important creation, Man, was emphasised. The knowledge of Man and the study of Nature, practical as well as theoretical, served to glorify God and emphasise the true religion.¹⁰

Morsing's influence on the lecture list appear to have been significant and is visible among other things in the recommendation of Rudolf Agricola (a. 1444–1485) for the study of dialectic. Agricola like Petrus Ramus offered a different view on logic and was an advocate of the Aristotelian approach. At the University of Copenhagen, Agricola's books remained part of the syllabus well into the seventeenth century. Logic and dialectic, as opposed to the natural philosophical ideas of Peter Ramus, managed to stay clear of the kingdom's leading theologians who spearheaded the drive for Lutheran uniformity within Church and State. This served to link an earlier period's Philippism with the views of a later period's orthodox Lutherans about natural philosophy, investigations of Nature, and metaphysics. Ramism did not recognise metaphysics as a discipline as opposed to Lutheran Orthodox theologians who took considerable interest, using an Aristotelian approach. A similar emphasis on Aristotelianism is in evidence in the way medicine was taught at the University. Nonetheless, the incongruity between Ramist logic and the approach taken by Orthodox Lutherans was fairly modest. If we disregard the important doctrinal and confessional standpoints on for example the Sacrament and the metaphysical question about the ubiquity of God and his Son, the unity between God and Nature was accepted by both Ramist natural philosophers and Lutheran theologians. The Ramists did not argue for a non-religious understanding of nature. For them as well as orthodox Lutherans, faith remained unaffected by logic. We should therefore not be surprised that the professor of mathematics and physics, Anders Krag (1553–1600) in 1592 supervised a series of theses on natural philosophy following the concepts of Ramus. It is, however, noteworthy that Krag in the same theses underlined the need for enquiries into Nature to correspond with Scripture. Anything, which contradicted this union, could, of course, be seen as heresy or false doctrine.¹¹ Ramism and Anti-Ramism reached some sort of consensus in the first decades of the seventeenth century with prominent professors at the University such as Ole Worm, Casper Bartholin, their father-in-law, Thomas Fincke (1561–1656), not to mention Tycho Brahe's former assistant, the astronomer Christen Sørensen Longomontanus (1562–1647), whose pedagogical and theoretical interventions did not bring them into conflict with established religion whether they were inspired by Ramism or Aristotelianism.¹² Natural philosophy was a tool benefitting the investigation of God's creation. Thus Man and his reason, despite the Fall, might provide crucial insight into Nature in a religious world. Or as Longomontanus saw it – he

could observe comets and stars with his eyes and through his instruments, yet the same comets and stars could also be seen as omens of evil, or signs from God, which formed part of the history of Christianity. Another Brahe-disciple, the widely travelled Norwegian professor of pedagogics and from 1607 of theology, Kurt Aslaksen (1564–1624), likewise recorded meteors and other astronomical events in his time table of the history of the church from the Reformation Jubilee in 1617, *Theologiske oc Historiske beskriffuelse Om den Reformerede Religion* (published 1621–1622). These heavenly phenomena were obviously signs from God about important events in the history of the Church.

Otherwise, the new Lutheran university followed the Wittenberg model closely. The reorganisation of the University of Copenhagen in 1537 undoubtedly had waited for Melanchthon's reformation of the University of Wittenberg the previous year and the 1539 Statutes of the University of Copenhagen were closely modelled on Wittenberg. The University of Copenhagen, however, proved a much poorer and far more parochial institution and initially struggled to find suitable candidates for its academic chairs. It proved particularly difficult to recruit professors in medicine and law. Only a generation later during the reign of Frederik II, did the University's financial situation improve when a Royal Trust providing bursaries for talented students was established, salaries for professors improved, and colleges were built. This served to raise the academic standards significantly and students were obliged to finish their BA within three years. Royal stipends or grants to study abroad were instituted too with three for theology students and one for a medical student on an annual basis. As a result, after 1570, every University chair was for the first time occupied. The Paracelsus inspired physician Johannes Philipp Pratensis (Hans Phillipsen, 1543–1576) joined Hans Frandsen in medicine, taking up the chair in practical medicine. Law, however, continued to have problems filling its vacancies, as a result the University did not promote any masters of law during the sixteenth century. According to later lecture lists Law was restricted to offer lectures only in the subjects mentioned in the Statutes of 1539, such as Roman law and the legal effects of the Danish marriage acts. The only professor in Law mentioned in the Statutes was moreover assigned to the Faculty of Theology. He had to confer on any difficult questions with his theological colleagues – so that Law and Gospel did not get mixed up improperly, as the Statutes stated. Law was, in other words a discipline only in name. When the physician Jonas Charisius in 1603 wished to present a thesis for the law degree the professor of law proved unable to personally preside. Eventually a doctor of law who worked in the Foreign Office (The German Chancellery) was found and the ceremony could take place.¹³ Even by the end of the seventeenth century, a doctor of Law still had to be promoted at the University and for the celebration and doctoral promotions linked to the Danish Reformation Jubilee at the University in 1736, the King extraordinarily had to appoint a couple of doctors of Law in order to facilitate the promotion of others.

By then the University of Copenhagen had acquired four faculties with theology as the highest ranked and Arts as the lowest. As the leading faculty

theology was provided with three chairs; the Bishop of Zealand held one of them. Wittenberg-educated theologians occupied the three professorships throughout the sixteenth century providing an interesting contrast to their medical colleagues who, as we have seen, virtually all held MDs from Basle. Despite the fact that Denmark retained a distinct preference for Melanchthonian Lutheranism beyond the fall of Caspar Peucer and Saxon Philippism in 1574, the Theology Faculty in Copenhagen continued to depend on the University of Wittenberg to educate its professors. In the period 1537–1600, fifteen men filled the chairs in theology, four were doctors of Theology from Wittenberg, eight masters. Similarly, the faculty of Arts, during this period had forty-one professors of whom thirty-one were Wittenberg educated. Thus, Wittenberg remained the key source of inspiration throughout the sixteenth century, and consequently any changes within the Saxon ‘mother’ institution affected Copenhagen. In effect, the University of Wittenberg and with it the University of Rostock, which also attracted significant numbers of Danish students, was the largest university for Danish students. The University of Copenhagen produced twenty-seven masters between 1537 and 1560 at the same time as the University of Wittenberg promoted forty-five Danish masters.¹⁴ Not until after 1570 did the University of Copenhagen begin to produce the required and expected numbers of candidates for church and state.

The theology curriculum in Copenhagen was a copy of what was taught in Wittenberg. The theologians lectured on Holy Scripture using Luther’s *Commentary on Galatians and Matthew 5–7*, *The Apology for Confessio Augustana*, Melanchthon on Romans, and inevitably, Melanchthon’s *Loci communes*. The Law professor would also lecture on the *Loci communes* – but if erudite, he would also cover Plato, Cicero, history, or Aristotle’s Politics. These were exactly the subjects which the Academy in Sorø intended to cover when it was established. In the case of medicine, the 1539 Statutes also called for lectures in astronomy.

The Arts faculty had six professorships, *paedagogus*, *rhetoricus*, *graecus*, *physicus*, *mathematicus*, and the *dialecticus* – the latter position normally considered a stepping-stone to a professorship in theology. The Statutes also made provisions for one of the parish priests within Copenhagen to teach Hebrew.¹⁵ In 1557, Hebrew was given its own professorship.

The significance of Philippism

All Danish post-Reformation theologians defined themselves as Lutherans irrespective of their theological leanings, be it evangelical, Philippist, or gnesio-Lutheran, nor did it matter whether they were Aristotelians, Ramists, or Anti-Ramists. As we have seen, the whole post-Reformation educational system in Denmark closely followed the structure laid out by Melanchthon. This proved an approach which both government and church stuck to for decades.

By 1560, Philippism had become the established theology of the Danish Lutheran church. The government and church leaders took little or no notice of the growing split between Philippist and gnesio-Lutherans within Lutheranism

and continued to consider Lutheranism to be unchanged and undivided. Consequently, when *The Book of Concord* appeared in 1580, it was considered an unacceptable innovation by the Danish King and his theologians. Frederik II considered his brother-in-law, the Elector of Saxony, to have been manipulated by Jacob Andreae, and thus repeatedly instructed his own theologians,

that for the administration of the state nothing is more urgent than excluding troublemakers, because they are a plague and deprave all good citizens. Therefore I am much displeased when someone provokes strife and doubts the truth of the doctrine and order of the church, which in the days of our fathers was consolidated . . . and I have always loathed everybody . . . , who has tried to corrupt or distort the perfect heavenly doctrines, which were entrusted to us.¹⁶

The *Book of Concord* was, of course, the work of the gnesio-Lutheran Saxonian government and its theologians, who in 1579 had caused the dismissal of the prominent Danish theologian, Niels Hemmingsen (1513–1600) from the University of Copenhagen, having accused him of crypto-Calvinism in his Eucharistic theology. Even if King Frederik II was forced to dismiss Hemmingsen from his chair in theology, he was in no way inclined to accept the gnesio-Lutheran position and he declared that if anyone possessed a copy of the *Opus Concordiae*, which contained this doctrine, ‘to us and our churches foreign and improper’, he should be punished severely.¹⁷ The King led by example, having received two beautifully bound copies of the *Book of Concord* from his sister Electress Anna of Saxony, he immediately had them thrown on the fire, as he informed Landgrave Wilhelm of Hesse.¹⁸

Niels Hemmingsen

By the reign of King Frederik II, the Lutheran church in Denmark–Norway had become increasingly Philippist or Melanchthonian not least due to the influence and leadership provided by Niels Hemmingsen, by then the country’s leading theologian whose many theological works were widely published and admired across Protestant Europe. Hemmingsen proved hugely important as a teacher and came to influence the outlook of the next couple of generations of leaders within the University, across all faculties, and bishops within the Church, not to mention government officials.

Niels Hemmingsen was born on the Island of Lolland in 1513 and had studied at the University of Wittenberg from around 1537–1538 to 1542. Either in 1542 or 1545, he took up a post in philosophy at the University of Copenhagen. He lectured in dialectics using Melanchthon’s textbooks. In 1547, Hemmingsen was given a chair in the faculty of theology, despite not yet having become a doctor in divinity. This first happened six years later, in 1553, when he defended his co-professor John MacAlpine’s twenty-four theses on the Lord’s Supper. Hemmingsen retained his position as the leading professor of theology until his

suspension from the University in 1579, whereafter he resided at the Cathedral in Roskilde as a canon until his death in 1600.

Hemmingsen acquired European fame as one of the period's leading Protestant theologians and he was regularly sought out by visitors to Copenhagen. In 1588 Elizabeth I's envoys, Josias Mercier and Daniel Rogers, reported that they had seen the magnificent cathedral in Roskilde and visited Niels Hemmingsen. When in 1590 James VI of Scotland visited Copenhagen, he found time to visit the University and Niels Hemmingsen.¹⁹

Hemmingsen was a prolific author producing nearly a hundred titles published throughout Europe in Latin as well as a number of European languages. His mainstay was biblical commentaries, especially on the letters of Paul and John.²⁰ His principal work on theology was the *Enchiridion theologicum* (1557), which he himself claimed was an introduction to Melanchthon's *Loci communes*, and his systematic theology, *Syntagma institutionum christianorum* (1574). The *Enchiridion* proved particularly popular in England, where it was published first in 1577 and then in 1580. His book of sermons, first published in 1569, likewise went through several English editions. His dogmatic works were influenced by John Calvin, even if Hemmingsen for obvious reasons never referred to him. Hemmingsen advanced the Melanchthonian concepts of Law and Gospel, the view on secular authority, as well as the role of predestination. He rejected Calvin's teaching on double predestination and emphasised, in accordance with Melanchthon, God's wish for the salvation of the faithful and penitent; a view he sought to popularise in his Danish pamphlet.

Niels Hemmingsen also produced a number of publications which stated the official position and theology of the Danish Lutheran Church. He drew up the *Tabella de coena Domini* (The Eucharistic Table) (1557) which all the leaders of the Danish Church were obliged to sign, he edited the *Articles for Foreigners* (1559) directed against Sacramentarians and Anabaptists, and he wrote an unpublished Philippist confession and reformulation of the Danish Church Order, *Confessio et Ordinatio ecclesiarum Danicarum* (1561), in which the church was described as the communion of the *puritas doctrinae Christianae*. It is evident from this manuscript that Niels Hemmingsen already then felt uncomfortable with the original Lutheran interpretation of the Eucharist as expressed in *Confessio Augustana* (1530).²¹ The Danish church had, of course, never officially accepted the Augsburg Confession. In the final draft of the Danish Church Order edited by Johannes Bugenhagen, only the *Apologia* for the Augsburg Confession is mentioned as a book necessary for pastors. Moreover, when Hemmingsen and other leading Philippist theologians mentioned the Augsburg Confession, they invariably failed to mention which edition they meant. They evidently did not mean the original 1530 version with the Lutheran view on the real presence in the Eucharist. Their failure – even as late as the beginning of the seventeenth century – to clearly indicate that they were referring to the so-called *Invariata* version of the Augsburg Confession indirectly confirms their adherence to Melanchthon's altered version from 1540 the so-called *Variata* – which came closer to the teaching of Calvin on the Eucharist.

Niels Hemmingsen's theology was Philippist, but undoubtedly tended towards crypto-Calvinism, not only in terms of his Eucharistic theology. He leaned towards a rationalist understanding of theology and thus found the approach of Calvin easier to accept. In his 1562 tract on the law of nature, *De lege naturae apodictica methodus*, Hemmingsen wrote that Man is able to reason and understand: 'God created Man so that in him there are capacities which are *gnostikai* and *orektikai*, that is capacities by means of which things can be recognized and aspired to'.²² In other words, both nature and faith could be rationally comprehended.

Hemmingsen himself was also well aware of his dependence on the teaching of Calvin, as were his gnesio-Lutheran critics and adversaries.²³ The publication of the *Syntagma* in 1574 eventually proved a step too far for Hemmingsen. Here he raised the issue of the nature of the Eucharist:

Pardon? Is the body of the Lord, given for us, and his blood, which is shed for us, not truly and really present in the Supper of Our Lord? Indeed, Christ is present, though not regarding the place, because if you ask for the place, then the Body of Christ is reserved in Heaven, but in regard to the faith of the man who receives the Holy Eucharist in the right way.²⁴

It was Hemmingsen's international standing which eventually proved his undoing. King Frederik II's brother-in-law, Elector August of Saxony, had to his horror discovered that his own theologians in Wittenberg, especially Christoph Pezel and Caspar Peucer (Melanchthon's son-in-law), had been promoting a Eucharistic theology similar to Calvin's. He wrote to inform his brother-in-law that his Philippist theologians at the University of Wittenberg when confronted with this had justified their views by referring to Niels Hemmingsen's *Syntagma*. Faced with what amounted to a major diplomatic incident the King summoned Hemmingsen to explain himself. Hemmingsen initially, however, sought to deflect the affair as of no significance for the Danish Church:

Germany is huge, and it has many princes, and they are all under the Emperor, and every one of them has his own *Theologos*, and they adapt themselves *to the taste of their princes sicut coquus palatum Domini sui*. . . . Many Confessiones come out in Germany and within a fortnight sometimes one against another: that we should sign such documents is unfair.²⁵

Hemmingsen showed little inclination to make a full retraction of what he had published in his *Syntagma*, while the Danish government played for time hoping that the whole thing might die down. However, the Saxons were not prepared to let the matter rest and lodged repeated complaints about Hemmingsen, finally accusing Denmark of having become a safe-haven for Calvinists. For political reasons, if nothing else, something had to be done and Hemmingsen was suspended from the University of Copenhagen 'for highly important reasons and considerations' and for an unspecified period. He was

informed about his suspension and removal from Copenhagen in July 1579 by his former student the Royal Chancellor Niels Kaas.

Hemmingsen's difficulties were not helped when his major works were republished in Geneva in 1586 as *Opuscula theologica*, a collection with a preface, inspired by Theodore Beza and penned by Simon Gularsius, which sought to present Hemmingsen's theology as Calvinist. By the end of the sixteenth century, Hemmingsen's works had become popular among Calvinists and English Puritans in particular. Throughout his life, he corresponded with most of the leading Protestant theologians of the day: among the most noteworthy, apart from Philip Melanchthon, were Jakob Andreae, with whom he sharply disagreed about the Formula of Concord, Calvin's successor Theodore Beza, Casper Peucer, and David Chytraeus.

Hemmingsen's influence within the University of Copenhagen proved significant and enduring. In 1574–1575 he attended Tycho Brahe's (1546–1601) lectures on astronomy at the University which promoted a Neoplatonist natural philosophy and eclectic Paracelsianism, and publicly showed his approval of them. A couple of years later, Hemmingsen made the unusual suggestion that Tycho Brahe be made Vice-Chancellor despite not being a member of the University. Like his mentor Philip Melanchthon, Hemmingsen considered astrology to be important. In a letter from 1593 to the nobleman Henrik Ranzau, a keen astrologer and associate of Tycho Brahe, he admitted that he knew little of astrology himself, but he believed 'that all events had their causes, necessary and accidental, and that the exceptionally skilled could read future occurrences from the Book of Nature onto which God had written like a tablet'. Twenty years earlier when Tycho Brahe had given his lectures on astronomy at the University of Copenhagen, which argued for a Neoplatonist natural philosophy and an eclectic Paracelsianism, Niels Hemmingsen had been present and had publicly indicated his approval of them. Furthermore, Niels Hemmingsen would appear to have been behind the highly unusual suggestion in 1577 that Tycho Brahe be made Vice-Chancellor of the University of Copenhagen despite not being a member of it.²⁶

Hemmingsen had served as Vice-Chancellor of the University and as such had been involved in the growing influence of Paracelsianism within the faculty of medicine. Hemmingsen had allowed Johannes Pratensis, who was attracted to Paracelsianism to become professor of medicine in 1571. Pratensis and his friend, Petrus Severinus (1540/1542–1602) had recently returned from their extended *peregrinatio medica*. King Frederik II had called Severinus home to become Royal physician and both he and Pratensis were favoured by the King regardless of some caution towards their new-fangled Paracelsianism within the University. In 1571, Severinus published his Paracelsus inspired, *Idea medicinæ philosophicæ*; a glance at the full title of the work, however, tells us that Severinus was no radical and wanted to place the his Paracelsianism within learned medicine and the teachings of Galen and Hippocrates.²⁷

Johannes Pratensis was awarded his chair in medicine with some limitations to what he was allowed to teach. He should lecture exclusively on Hippocratic

and Galenic medicine in accordance with what was taught at the Universities of Wittenberg and Leipzig – solid Lutheran institutions. It has been debated whether this restriction was introduced in order to prevent Pratensis from being too innovative and Paracelsian in his teaching, or only inserted to satisfy more conservative members of the University who had doubts about giving him a chair. However, bearing in mind that Melanchthon's son-in-law, Caspar Peucer, who can hardly be described as a traditional Galenist, was the leading professor of medicine at the University of Wittenberg at this time, it would hardly have been difficult for Pratensis, who had himself studied at Wittenberg, to accept these restrictions.²⁸ Pratensis evidently did not feel circumscribed or hindered in his teaching and when he suddenly died five years later in 1576, the University of Copenhagen officially commemorated his efforts 'in the exercise of both these systems of medicine, the Galenic and the Paracelsian'.²⁹

Melanchthonian Lutheranism had no problem with accommodating Paracelsianism. However, the link between Paracelsianism and less orthodox religious views is notable. Tycho Brahe and his 'research centre' in Uraniborg on the Island of Hven offers a pertinent example. Apart from astronomy, Brahe and his assistants were also engaged with alchemy and Paracelsianism, and the Lutheranism of many of the scholars on Hven had a distinctly Calvinist flavour which the fall of Hemmingsen in 1579 for crypto-Calvinism did little to soften. Furthermore, Brahe and his assistants were able to exert considerable influence within the University of Copenhagen. Kurt Aslaksen, who was appointed professor in theology in 1607 joining Hans Poulsen Resen, had been Tycho Brahe's assistant for a number of years prior to his appointment. Aslaksen's theology was Melanchthonian with clear Calvinist influences. Gradually, however, he was felt obliged to adopt a more Lutheran stance due to the growing pressure from both government and Church promoting Lutheran uniformity. From some of Aslaksen's lecture notes we can see that nominally at least his lectures were in accordance with the Statutes of 1539, using Melanchthon's *Loci communes*, but the content on closer inspection reveals considerable influence from Calvin. Aslaksen's crypto-Calvinism is also in evidence in the unusual work he published in 1597, *De natura coeli triplicis*, which drew inspiration from both his former mentor Tycho Brahe and John Calvin, combining theology and natural philosophy – the Bible and the Book of Nature.

In 1597, the year Tycho Brahe after having fallen out of favour left Denmark, Hans Poulsen Resen was made professor of theology on the order of the Chancellor Christian Friis of Borreby. Until recently, this has been interpreted as a victory for Orthodox Lutheranism, but recent scholarship has questioned that. First, it is deeply problematic to see Resen as a gnesio-Lutheran at this stage if at all. Second, if the government was moving decisively towards an Orthodox position, why was Johannes Stephanius (1561–1625) chosen to be Resen's successor as professor of dialectics by Christian Friis personally? Stephanius who had been an assistant to Tycho Brahe in the 1580s, was a known Philippist with interests in Hermeticism and Paracelsianism. Furthermore, Stephanius was quickly joined by other former assistants of Tycho's at the University. In 1600

Jon Jacobsen Venusin was made professor of natural philosophy, and in 1602, Christan Hansen Riber, who had been a tutor on Uraniborg from 1586 to 1590 and had served Brahe during his stay at Wandsbeck in 1598, was made professor of mathematics, only to become Bishop of Aalborg in 1610.³⁰

The nobleman Sivert Grubbe, a member of the King's Council and an associate of Tycho Brahe wrote in his diary about the widespread disappointment in Denmark with the gnesio-Lutheran changes at the University of Wittenberg and the Formula of Concord. Instead he had found a friend in Theodore Beza and the Genevans, who preached 'the true and right religion'. Tycho Brahe and his assistants were in other words advocating a Philippist Lutheranism which found it easy to accommodate aspects of Calvinism.

The strength of the Melanchthonian tradition

Despite the fall of Hemmingsen, Philippism remained dominant within both Church and University in Denmark for decades. Thus Hemmingsen's successor Jacob Madsen Aarhus (1538–1586) and many of the theologians which later moved to a more Orthodox position were to a greater or lesser extent followers of Melanchthon. Madsen Aarhus was like Hemmingsen a first class scholar, having studied in Leipzig, Heidelberg, and Wittenberg – his close associates while studying abroad were the learned historian Anders Sørensen Vedel (1542–1616) and the theologian and playwright Peder Hegelund (1542–1614), a firm Melanchthonian who became Bishop of Ribe and the schoolmaster of Hans Poulsen Resen. Madsen Aarhus proved an exponent of late Danish Humanism. He was a keen student of Greek and Latin, and like Hemmingsen, he wrote extensively on methods, biblical commentaries, and took an interest in the historical writings of Adam of Bremen. On the delicate question of the Eucharist, Madsen Aarhus agreed with Hemmingsen; taught by experience, however, he expressed his views in more Lutheran terms. In his posthumously published works, it became clear that Madsen had been attracted to the ideas of Peter Ramus. In Madsen Aarhus's philosophical works such as *Doctrina de concionandi ratione et caussis eloquentiæ* (1589) and *Doctrina de ratione docendi* (1590), he criticised Aristotelian logic, yet in his important linguistic study, *De literis libri duo*, published in Basle in 1586, he also took issue with Ramus, but still quoting him repeatedly. Madsen Aarhus also made far greater use of Plato than any of his predecessors. He also took a considerable interest in philology and the Danish language in particular. His work served to inspire the Danish grammars for use in schools produced by the Johann Arndt-inspired professor Jens Dinesen Jersin (1588–1634).³¹

With the writings of Jakob Madsen Aarhus, Ramist natural philosophy came to influence Danish theology and linguistics. Soon a comprehensive critique of the Aristotelian structures of theology and natural philosophy followed. The Ramist influence grew within the University and found exponents among a number of leading scholars. Madsen Aarhus' successor, professor Hans Olufsen Slingerup (d. 1596) – who unusually had obtained his doctorate in theology

from Basle – was familiar with Ramism, but personally inclined towards Neo-Aristotelianism as can be seen from his commentary on Aristotle's *Analytica* from 1585. The rector of Sorø Academy and later professor in dialectics at the University of Copenhagen, Johannes Stephanius and the physician Anders Krag, who served as editor and publisher of Madsen Aarhus's works, were both attracted to Ramist thinking. Krag was fond of Plato too, and in 1598, he published a translation of Plato's *Parmenides* explaining that this dialogue ought to counterbalance Aristotle's *Metaphysics*, which he had just lectured on. Johannes Stephanius, however, was an eclectic Aristotelian, and a Philippist.³² Stephanius, though, also used Hans Poulsen Resen's works on rhetorics and dialectics. Thus Philippism remained dominant within both Church and University at the beginning of the seventeenth century, and happily accepting both Ramist or Aristotelian philosophies not to mention the ideas of Plato and Paracelsus.

The drive for religious uniformity

The young Christian IV (1577–1648) succeeded his father in 1588. A regency was established until Christian's coronation in 1596. During his reign, a more confessionalised state took shape promoted and driven forward within the Church by Hans Poulsen Resen (1561–1638), who had been made professor of theology in 1597.³³

Hans Poulsen Resen had been able to undertake a seven-year *peregrinatio academica*, studying among other places in Rostock and Leipzig, and receiving his BA in Wittenberg, which once again had turned Philippist. Resen concluded his travels by visiting Italy and the Universities of Padua, Rome, and Naples before returning home via Geneva. Promoted by Christian IV's Chancellor Christian Friis of Borreby who sought to create a stronger and more centralised state, Resen assisted Friis in creating a more uniform Lutheran Church. These moves were considered particularly urgent because of the growing impact of Counter-Reformation Catholicism and Calvinism in Scandinavia. Resen's campaign for theological uniformity within the Church eventually resulted in a number of 'liberal' Philippist or crypto-Calvinist losing their positions within University and Church in the second decade of the seventeenth century. But neither Resen nor Christian Friis can be properly described as gnesio-Lutherans – the Book of Concord remained anathema in Denmark – instead they wanted a uniform Church for political and ecclesiastical reasons. Philosophically Hans Poulsen Resen was attracted towards Neoplatonic ideas and was positively inclined towards Paracelsianism and Ramism. Resen's Ramist and Melanchthonian orientation is evident in the reforms of the Latin Schools he oversaw in 1604.³⁴ Furthermore, Resen was strongly influenced by the 'pre-Pietist' theology of his noble friend, Holger Rosenkrantz, the Learned, who in turn was inspired by the German theologian Johan Arndt. Rosenkrantz like Arndt wanted to complete the reformation Luther had commenced in teaching with a reformation of life. The government's prohibition of 1623 against swearing and disregard of holy days, and the penitential ordinance of 1629,

issued to improve piety among the people, were both formulated by Resen and show the 'pre-Pietist' influence on his ecclesiology.³⁵

The Neoplatonic and speculative aspects of Resen's theology are clearly in evidence in his writings leading up to his confrontation with the crypto-Calvinists within the Danish Church in 1614, the year before his elevation to the bishopric of Zealand. There were considerable overlaps between important aspects of Resen's theology and that of the spiritualist Sebastian Franck who, of course, was an admirer of Paracelsus. Hans Poulsen Resen owned a copy of Franck's *Paradoxa*, which he annotated heavily. It is most likely from Franck that Resen got his ideas about Christ's eternal omnipresence in Nature. Likewise, Resen's teaching about '*unio mystica*', concerning Christ's innate presence in the reborn Christian, is most likely inspired by his reading of Arndt's *Vier Bücher von wahrem Christentum*, of which he possessed a heavily annotated copy. Arndt, like Franck, was, of course, also fascinated by Paracelsianism.

Thus it was most fitting that it was Hans Poulsen Resen who delivered Peter Severinus's funeral sermon in 1602. Apart from the inspiration he had received from his reading of Arndt and Franck Resen, of course, while a mature student had deliberately sought out and befriended a number of far from orthodox Neoplatonist philosophers, such as the Englishman John Dee and the Italian Giordano Bruno.³⁶

Resen managed to defeat the crypto-Calvinists within the Church in 1614, but he himself did not emerge from this theological confrontation unscathed. He was forced to promise not to publish theological tracts in future similar to his recent Neoplatonic, Christological disputations. Even so, this experience did not appear to have changed Resen's views. His subsequent writings only played down the mystic elements of his theology, but maintained the Neoplatonic outlook. Thus Resen never disowned Neoplatonism, even if he made a point of dismissing Rosicrucianism as dangerous religious fanaticism.³⁷

The physician Ole Worm, who retained a strong interest in Paracelsianism throughout his life, took an early interest in the Rosicrucian phenomenon, seeing a manuscript copy of the *Fama Fraternitatis*, as early as 1611 while in Marburg, and he continued to seek as much information as possible about the so-called Rosicrucian Society over the next seven years. Despite growing concerns about Rosicrucianism in Copenhagen, Worm remained positively inclined towards it. However, the fact that in 1618 he lent some of his Rosicrucian pamphlets to his colleague in the theological faculty, Professor Jesper Brochmand, would indicate that Worm was seeking some sort of religious guidance on the phenomenon. If so, he must have been disappointed. If anything, Brochmand had been baffled by the pamphlets and when returning them to Worm, stated: 'But to explain the new things, about which you have enigmatically written to me, an Oedipus would be needed'. This reference to the riddle of the Sphinx made it clear that Brochmand found it impossible to give a considered view of the pamphlets.

By March 1618, Ole Worm had reached the conclusion that Rosicrucianism was a 'sect' spreading dangerous religious heterodoxy. In his speech to

graduating students in May 1619, Worm warned them about the dangers of Rosicrucianism. Finally in August 1620, Worm rejected Rosicrucianism which he now realised was nothing but an amalgamation of sects, pointing out that it had nothing to do with Lutheranism, but only contained a dangerous mixture of fanaticism, Anabaptism, and Paracelsianism.³⁸ Even if Worm had rejected Rosicrucianism in 1620, he continued to take an interest in it and as late as 1623 asked one of his students to obtain books published by known Rosicrucians.³⁹ Irrespective of his rejection of Rosicrucianism, Ole Worm openly continued to pursue his interests in iatrochemical and Paracelsian medicine.

Hans Poulsen Resen was a friend of Holger Rosenkrantz, the Learned, and despite their theological differences which gradually became clearer during the 1620s, they were both influenced by John Arndt and shared a pre-Pietist Lutheranism.⁴⁰ Holger Rosenkrantz therefore actively supported Resen when he found himself accused of heresy due to his speculative treatises on the Trinity, *De deo triuno* (1609), and on Christology, *De uno mediatore dei et hominum* 1–3, (1611–1613). Similarly, Rosenkrantz supported Resen's concerted campaign against suspected crypto-Calvinists within the Danish Lutheran Church from 1614 onwards, which even resulted in the removal of Hans Poulsen Resen's own brother-in-law as Bishop of Funen in 1616.

Undoubtedly by 1615, Resen was totally dominant within the Danish Church, having been appointed Bishop of Zealand and supreme bishop of the realm while retaining his professorship in theology. He clearly considered himself to be a true Lutheran reformer denouncing crypto-Calvinism as well as Philippism. However, Resen never had any intention of removing all Philippist influences within the Church. What Resen sought was a return to the true Wittenberg theology, which for him meant a combination of Luther and Melanchthon. Concerning education, Resen if anything was a Philippist as can among other things be seen from his input in the Latin School reform of 1604 where he introduced Melanchthon's *Loci Communes* into the religious curriculum. The theology Resen wanted for the Danish Lutheran Church was one based on the original consensus between Luther and Melanchthon.

The consolidation of Lutheran uniformity

Traditionally, the period from 1615 when Hans Poulsen Resen reached the zenith of his power within the Church, and to 1652 when his successor as leader of the Danish Church, Jesper Brochmand, died, has been seen as an age when Orthodox Lutheranism dominated society, Church and University. On one hand, this is correct: Resen and Brochmand both brought uniformity and what they perceived as the right Lutheran dogma to the Danish Church. On the other, it misses the point: Resen was not a gnesio-Lutheran in the traditional German mould. He was not exclusively influenced by Luther, but was a keen student of both Calvin and Melanchthon, and in terms of natural philosophy, he was influenced by Philippism, as well as Aristotelianism, and Ramism; Calvinist theology was tolerated as long as it was not directly presented as such or used

controversially to challenge true Lutheran doctrine. The Faculty of Theology exercised control over what was allowed to be published in Denmark-Norway. It mainly exercised its power by discouraging authors from writing anything which might challenge the established theology of the Lutheran Church. Even so, its censorship was fairly ineffective and did not limit works published to those which were orthodox. Confessionalisation with its emphasis on correct doctrine, in the case of Denmark, the right type of Lutheranism resulted in a theology which became inwardly focussed, seeking to define correct doctrine while rooting out all heterodox tendencies. The result was first that the Melanchthonian natural philosophy, which had come to dominate after the Reformation, with its emphasis on the significance of investigations into the created world – the Book of Nature – as a supplement to the Word of God in the Bible, kept flourishing. Second, the narrow focus of orthodox Lutheran theology on doctrine and theology eventually resulted in a growing separation between theology and investigations into Nature. However, throughout the first half of the seventeenth century, the drive for Lutheran uniformity in Denmark did not in any way limit or hinder new or for that matter old natural philosophical undertakings. Neither Resen nor Jesper Brochmand had any reservations about the natural philosophy expressed by their colleagues within and without the University, be it Melanchthonian, Paracelsian, or Ramist, and found none of these approaches in conflict with the Lutheranism they espoused. The colossal nearly 4,000-page-long *Universæ Theologiæ Systema* which Jesper Brochmand published in 1633 is a prime example of the increased narrow theological focus and teaching – leaving little time and space for influencing philosophical debate within the University.⁴¹

By the late 1620s, Jesper Brochmand had become the dominant force within Church and University. Brochmand was a pupil of his older colleague Hans Poulsen Resen, and like Resen, he was closely associated with Holger Rosenkrantz, the Learned. From 1624, he and Resen were joined by Caspar Bartholin, who had exchanged his professorship in medicine with one in theology.⁴²

Jesper Brochmand had begun his university studies at the University of Copenhagen in 1591, but after three years, he left for the University of Leiden in the Netherlands where he matriculated in theology before continuing his studies a year later at the University of Franeker. He returned home in 1608 to graduate and become headmaster of the new humanist school of Herlufsholm where he himself had been a pupil. Only two years later, Brochmand became professor of pedagogy at the University, only to exchange his professorship for one in Greek in 1613. Brochmand had been a firm supporter of Resen's during the latter's campaign against crypto-Calvinists within the Danish Church in 1614 and quickly came to be seen as Resen's spiritual heir. In 1615, when Resen became Bishop of Zealand, Brochmand received his doctorate in divinity and was promoted to the vacant chair in theology. In 1617, Jesper Brochmand received Royal approbation when he was appointed tutor to the Crown Prince. It was while he served in this capacity over the next three years before returning to the University that he befriended Holger Rosenkrantz.

Renewed Catholic missionary efforts in Denmark in 1622–1623 alarmed Jesper Brochmand, and he threw himself into countering what he considered to be dangerous Catholic propaganda. He entered into a lengthy debate with the Jesuit Robert Bellarmin (1542–1621), publishing first *Controversiarum sacrarum Pars I* and *Pars II* (1626–1627) attacking Bellarmin's use of Scripture and his teaching about Christ, and then in 1628, he published *De pontifice Romano*. Brochmand considered the Pope and the Jesuits a serious threat to the Lutheran Churches in Scandinavia by the beginning of the seventeenth century. He even tried to awake the laity to this impending danger, and a popular version of his attack on the Catholic Church was published in 1627 under the striking title: *Godly Instruction, whether a Child of God Can Embrace the Papist Religion without Damaging the Soul*. Brochmand's anti-Catholic and anti-Jesuit polemics may well have lead him towards a more orthodox and conservative Lutheran position, which increasingly came to characterise his theology from the late 1620s. However, like Resen and his colleague from 1624, Caspar Bartholin, Jesper Brochmand is difficult to fit into the mould of a traditional gnesio-Lutheran.

A few years earlier, Jesper Brochmand had joined Caspar Bartholin, then still professor of medicine, in drafting new Statutes for the University of Copenhagen, which were primarily concerned with the study of theology and medicine which they intended to change radically. In medicine, they proposed that the first professor in future should focus on practical medicine, first six months should be dedicated to botany followed by *rebus metallicis et mineralibus* in the other six. The intention was to give medical students a comprehensive training in how medicines were made. The second professor should lecture on medical theory, and every winter, he should provide anatomical instructions through dissections and demonstrations from a skeleton. He was to be provided with an assistant – a barber-surgeon – who could instruct the students in surgical techniques. In theology, it was proposed that the first professor, who would also be the bishop of Zealand, would lecture on the Gospel, while the second professor would focus on the Old Testament. The third professor should then concentrate on dogmatics or, as suggested by Holger Rosenkrantz, offer a purely linguistic study of Scripture. Eventually when the New Statutes for the University were introduced in May 1621, very little of Bartholin's and Brochmand's ambitious draft survived. Instead the New Statutes were concerned with safeguarding doctrinal orthodoxy among future schoolmasters and ministers. In future students of theology who wanted to study abroad were limited to universities which corresponded in doctrine with Lutheran Denmark if they wanted to become ministers or schoolmasters on their return. Students of medicine, together with sons of the nobility, were not subject to such restrictions, because they needed to go to the best seats of learning irrespective of their confessional orientation.⁴³

It would appear that Jesper Brochmand lost his taste for innovation during the 1620s, gradually becoming more and more focused on defending what he considered to be true Lutheranism. His increasing focus on the right teaching and understanding of Scripture meant that Brochmand primarily made an

impact on the church, less so on the University, and not at all outside theology. Here he differed significantly from his teacher Hans Poulsen Resen and also from Caspar Bartholin who was his colleague within the Faculty of Theology for five years between 1624 and 1629 and who considered the study of the Book of Nature – God’s creation – an important addition to the study of the Bible.

Furthermore, where both Hans Poulsen Resen and Caspar Bartholin considered the Reformation an unfinished business which had to be taken further and result in a reformation of life, Jesper Brochmand saw the Reformation as a finished process which was only in need of control and occasional adjustment of teaching and doctrine. Resen and Bartholin had wanted to complete what Luther had begun in terms of teaching, with a reformation of the whole of society. Jesper Brochmand’s theology focused on metaphysical and moral questions, true belief, and the systematisation of right and wrong in religion, but did not go beyond that. For Brochmand, natural philosophy and enquiries into Nature fell outside his interests as long as they did not undermine the religious uniformity he promoted. Gradually, the Melanchthonian unity between theology and natural philosophy was lost or downgraded, even though the connection between the study of the Bible and the investigation of the created World never totally disappeared.

Notes

- 1 Kristian Jensen, *Latinskolens dannelse. Latinundervisningens indhold og formål fra reformationen til enevælden* (Copenhagen, 1982), 49ff; 67ff. The relevant paragraphs on schools, curriculum, and general education in Martin Schwarz Lausten (ed.), *Kirkeordinansen 1537/39* (Copenhagen, 1989), ‘Om scholerne’; quotation in my translation from the Latin version. The 1546-regulations in Olaus Cimber Theophilus, *Parænesis seu præceptiones sapientes et utiles de vitæ ac studiorum honesta formatione . . .* (Copenhagen, 1573), Ar–A4r.
- 2 Peder Palladius, ‘Vistiatsbogen [a. 1543]’, in Lis Jacobsen (ed.), *Peder Palladius’ Danske Skrifter*, vol. 5 (Copenhagen, 1926), 1–240; for schools see: 91–96 (94).
- 3 Jensen, *Latinskolens Dannelse*, appendix 1.
- 4 Theophilus, *Parænesis*, passim.
- 5 Jensen, *Latinskolens Dannelse*, 103–107 cf. Jacob Madsen (Vejle), A. Corne (ed.), *Mester Jacob Madsens Visitatsbog. Efter Originalen i Odense Bispearkiv* (Odense, 1853) and August Western, *Frederiksstad høiere almenskole gennem 300 år*, Frederiksstad 1915, 7.
- 6 See vol. 1 of [multiple authors], *Sorø. Klosteret. Skolen. Akademiet gennem Tiderne skrevet af gamle Soranere. Tiden før 1737* (Copenhagen, 1924).
- 7 The lecture list, ‘Ordinatio lectionum in Academia Haffniensis . . . AD MDXXXVIII’ in William Norvin Københavns (ed.), *Universitet i Reformationens og Orthodoxiens Tidsalder*, vol. 2 (Copenhagen, 1940), 4–8.
- 8 Cf. Vello Helik, *Dansk-Norske Studierejser fra Reformationen til Enevælden* (Odense, 1987), 42–44.
- 9 Ole Peter Grell, ‘Caspar Batholin and the Education of the Pious Physician’, in O. P. Grell and A. Cunningham (eds.), *Medicine and the Reformation* (London, 1993), 78–100, especially 82; for Morsing-quote see A. E. Brade (ed.), *Henrik Smiths Lægebog 1–4* (Copenhagen, 1976), Morsing’s introduction to 1556 edition, Aii. See also P. L. Panum, *Vort medicinske Fakultets Oprindelse og Barndom* (Copenhagen, 1879), 33–36.
- 10 Grell, ‘Caspar Batholin and the Education’, 83.

- 11 Anders Krag, *Theses physicae, in quibus instituitur reconciliatio inter ducem populi Israëlitici Mosen et philosophorum principes, de rerum naturalium principiis, solis verbis dissentientes* (Copenhagen, 1592).
- 12 H. D. Schepelern, *Museum Wormianum. Dets Forudsætninger og Tilblivelse* (Aarhus, 1971), 114.
- 13 H. F. Rørdam, *Kjøbenhavns Universitets Historie fra 1537 til 1621*, vol. 3 (Copenhagen, 1873–1877), 347–349.
- 14 Leif Grane, 'De humane studier og teologien i Wittenberg og København i det 16. århundrede. Komparative overvejelser', in Leif Grane (ed.), *Den uberegnelige Luther* (Copenhagen, 1992), 88–117, especially 104.
- 15 Grane, *Den uberegnelige Luther*, 100–101.
- 16 Personal memorandum (1585) to the professor from Frederik II, in H. F. Rørdam (ed.), *Danske Kirkelove*, vol. 2 (Copenhagen, 1889), 266–267.
- 17 Royal decree July 24 1580, in Rørdam, *Danske Kirkelove*, 322–323.
- 18 Letter from Frederik II to Wilhelm 8 February 1581, in H. F. Rørdam, *Kjøbenhavns Universitets Historie fra 1537 til 1621*, vol. 2 (Copenhagen, 1869–1872), 209–210; cf. Bjørn Kornerup, *Den danske Kirkes Historie*, vol. 4 (Copenhagen, 1959), 152.
- 19 Martin Schwarz Lausten, *Niels Hemmingsen. Storhed og fald* (Copenhagen, 2013), 331–333. Mercier's Latin diary, in C. Behrend, 'En Dagbog fra en Rejse i Danmark i Aaret 1588', *Danske Magazin* VI/1 (1913), 334–344 (343). For the English and Scottish visits, see Harald Ilsøe, 'Gesandtskaber som kulturfomidlende faktor. Forbindelser mellem Danmark og England-Skotland o. 1580–1607', *Historisk Tidsskrift* XI/6 (1960–1962), 574–600.
- 20 Bibliography in Lauritz Nielsen, *Dansk Bibliografi 1551–1600* (Copenhagen, 1919), 196–281.
- 21 Published in Bjørn Kornerup (ed.), *Confessio et Ordinatio ecclesiarum Danicarum* (Copenhagen, 1953).
- 22 Niels Hemmingsen, *Om naturens lov*, del 2, translated by Richard Mott (Copenhagen, 1992), 19.
- 23 Kjell Barnekow, *Niels Hemmingsens teologiska åskådning* (Lund, 1940), 284.
- 24 Syntagma, 503 cf. Lausten, *Niels Hemmingsen*, 311.
- 25 Translated from the excerpt in Kornerup, *Den danske Kirkes Historie*, 143.
- 26 See O. P. Grell, 'The Acceptable Face of Paracelsianism: The Legacy of Idea Medicinae and the Introduction of Paracelsianism into Early Modern Denmark', in O. P. Grell (ed.), *Paracelsus. The Man and His Reputation, His Ideas and Their Transformation* (Leiden, 1998), 255. Morten Fink-Jensen, *Fornuften under troens lydighed. Naturfilosofi, medicin og teologi i Danmark 1536–1636* (Copenhagen, 2003), 121–135.
- 27 On the influence on Severinus and his theories, see O. P. Grell, 'The Reception of Paracelsianism in Early Modern Denmark: From Peter Severinus, the Dane to Ole Worm', *Medical History* (1995), vol. 39, 78–94; same (ed.), *Paracelsus. The Man and His Reputation, His Ideas and Their Transformation* (Leiden, 1998), 245–268; and Jole Shackelford, 'Seeds with a Mechanical Purpose. Severinus' Semina and Seventeenth Century Matter Theory', in Allen G. Debus and Michael T. Walton (eds.), *Reading the Book of Nature* (Kirksville, MO, 1998), 15–44 and same, *A Philosophical Path for Paracelsian Medicine: The Ideas, Intellectual Context, and Influence of Petrus Severinus (1540–1602)* (Copenhagen, 2004).
- 28 Grell, *Medicine and the Reformation*, 87. Fink-Jensen, *Fornuften under Troens lydighed*, 145, note 95 questions Grell's analysis of Hemmingsen's positive attitude towards Pratensis and Severinus.
- 29 In Eyvind Bastholm (ed.), *Petrus Severinus og hans Idea medicinæ philosophicæ. En dansk paracelsist . . .* (Odense, 1989), 6–7, 43–44.
- 30 See Fink-Jensen, *Fornuften under troens lydighed*, 308–309.
- 31 See under Jacob Madsen Aarhus, in *Dansk Biografisk Leksikon* (3rd ed.).
- 32 Grane, *Den uberegnelige Luther*, 112–114.
- 33 See B. Kornerup, *Biskop Hans Poulsen Resen* (Copenhagen, 1928 and 1953), 182–185.

- 34 K. Jensen, *Latinskolens Dannelse*, 190–191.
- 35 For Resen's friendship with Rosenkrantz, see Andersen, *Rosenkrantz*, 133–138; see also Grell, 'The Acceptable Face', 258–259
- 36 Grell, 'Acceptable Face', 260.
- 37 Ibid.
- 38 Ibid.
- 39 O. P. Grell, 'In Search of True Knowledge: Ole Worm (1588–1654) and the New Philosophy', in Pamela H. Smith and Benjamin Schmidt (eds.), *Making Knowledge in Early Modern Europe. Practices, Objects, and Texts, 1400–1800* (Chicago, 2007), 219–220.
- 40 J. Oskar Andersen, *Dansk Syn paa Fromhed og 'Gudsfrygtheds Øvelse' i ældre luthersk Tid. En kirkehistorisk Indledning til Kingos 'Siunge-Koor'* (Copenhagen, 1931), xxxix, and Jens Glebe-Møller, *Doctrina secundum pietatem. Holger Rosenkrantz den lærdes teologi* (Copenhagen, 1966), 10.
- 41 Fink-Jensen, *Fornuften under troens lydighed*, 194–195.
- 42 For Holger Rosenkrantz, see Chapter 7; for Caspar Bartholin, see Chapter 6.
- 43 Grell, *Medicine and the Reformation*, 93–94, and Andersen, *Holger Rosenkrantz*, 189–198; see also Kornerup (1959), 279.

5 After Tycho

Philippist astronomy and cosmology in the work of Brahe's Scandinavian assistants

Adam Mosley

Introduction

Recent work on the astronomer Tycho Brahe has emphasised his relationship to the Lutheran tradition of astronomical and astrological investigation usually associated with the scholarship and curricular reforms of Philipp Melanchthon.¹ The importance of this tradition to the reception of Copernican astronomy and to the transformation of the study of celestial phenomena in the sixteenth and seventeenth centuries has long been recognised.² Yet, historians remain divided about how best to describe it. Some have been happy to label it a Lutheran mode of studying the heavens – part, indeed, of a Lutheran tradition of natural philosophy.³ Others, however, for reasons spelled out particularly clearly by Charlotte Methuen, have favoured a more cautious approach. With Luther himself largely indifferent to academic study of the natural world, and actively hostile to the scholastic traditions of natural and moral philosophy, it was indeed Melanchthon rather than Luther who promoted astronomy and astrology both within the university curriculum and as elite intellectual pursuits of particular religious significance. Yet as the process of confessionalisation unfolded, giving the very term ‘Lutheran’ its salience, Melanchthon’s right to be considered a Lutheran theologian was called into question, and close followers, such as his son-in-law Caspar Peucer, were accused of crypto-Calvinism. Thus, a tradition of philosophical inquiry that owed so much to Melanchthon may not have appeared *confessionally* very Lutheran, by the end of the century.⁴ At least partly for this reason, therefore, some have preferred to describe it as Melanchthonian or Philippist – terms with an established use in church history in charting one faction in the theological struggles *within* Lutheranism in the later sixteenth and early seventeenth centuries, in the German-speaking territories of the Empire and Scandinavia.⁵

The features of Lutheran or Philippist natural philosophy have also been debated. Both Charlotte Methuen and Gábor Almási have suggested that the doctrines usually described as underpinning Melanchthon’s promotion of astronomy and astrology, concerning the providential governance of the world, may have been *characteristic* of the tradition without being *distinctive*.⁶ In other words, individuals from different confessional backgrounds could and did share

very similar views about divine providence and order. Nor did attitudes favouring direct observation of phenomena, as opposed to the acceptance of authority, or particular approaches to the interpretation of scripture, diverge precisely along confessional lines. A recent contribution to the debate, Nienke Roelants' doctoral thesis of 2013, has pursued a different line of inquiry, suggesting that scholars such as Georg Joachim Rheticus, Caspar Peucer, and Tycho Brahe inherited from Luther himself, and not only Melanchthon, a moderate scepticism about man's postlapsarian capacity to attain knowledge of Creation.⁷ But Roelants' otherwise persuasive analysis fails what might be called the 'Methuen test', insofar as it has only demonstrated that this attitude was characteristic of the astronomers she has studied, not that it was universally present amongst Lutheran scholars, or absent from individuals belonging to other confessional groups. Roelants' analysis might yet provide the means of distinguishing a truly *Lutheran* astronomy from that of other confessions; more work would need to be done, however, to make the case secure.

Methuen herself posits that a confessionally distinctive Lutheran natural philosophy would be one shaped by the doctrine of Christ's ubiquity, Luther's way of accounting for his real presence in the Eucharist without transubstantiation. One would thus expect it to be noticeably different from Catholic and Reformed philosophy in its conceptualisation of body, place, and space.⁸ But Methuen does not point to the actual existence of such a natural philosophy – and cosmology as traditionally rather narrowly conceived by historians of early modern astronomy, as concerning the debate over world systems, might not seem a promising field in which to locate one.⁹ As we shall see, cosmological reflections on the part of Lutheran astronomers of a broader sort did touch on relevant concerns, but not necessarily in such a way as to clearly confirm their orthodoxy. That is hardly surprising; the position of Philippist theologians on the nature of Christ's presence was one of the chief grounds on which they were charged with crypto-Calvinism, and refusal to subscribe to the doctrine of Christ's ubiquity generated problems for the most famous 'Lutheran' astronomer of all, Johannes Kepler.¹⁰ Methuen's notion of Lutheran natural philosophy would thus seem ideally chosen to exclude, rather than include, those belonging to the Melanchthonian tradition. Perhaps that was her intention: to demonstrate the impossibility of there being a *Lutheran* natural philosophy before or without an orthodox Lutheranism.

A final reason for being circumspect about both the labelling and the characterisation of the astronomical legacy of Melanchthon is implicit in the very idea of 'tradition'. Though stabilised, to a considerable degree, by textbooks and curricula, doctrines and motivations are susceptible to change as they are transmitted, particularly perhaps from one generation to the next. Melanchthon himself, after all, did not produce his natural philosophy entirely *de novo*. Instead, he wove together various scholastic and Stoic resources in ways that were shaped by humanistic method, pedagogic needs and insights, and to a considerable extent, his own lived experience; his natural philosophy, and the uses to which he put it, were shaped by events of the early Reformation, the

concerns about maintaining moral and political order they generated, and doctrinal disputes.¹¹ Those he taught, directly or indirectly, appropriated, modified, and assimilated his materials in ways that could be just as creative and novel, in their context of own particular circumstances. In conjunction with Methuen's claim that a doctrinal shibboleth is absent, the potentially Protean nature of Philippist astronomy and cosmology might seem to make the prospects for studying it especially dim. That would indeed be the case if historians were forced to investigate astronomers' approaches to the study of the heavens *without* any knowledge of their lives. But those are not the conditions under which we inquire into the past. Indeed, we possess more than enough biographical data to treat the transformation of the intellectual tradition over the time and space as the very object of our study.

That, then is the purpose, of this chapter: to explore how one programme of investigation of the heavens with a Philippist provenance – that of Tycho Brahe – shaped others carried out in the next generation. No less than other representatives of the Philippist tradition, Tycho adopted and adapted the doctrines and agendas which he encountered in his youth, elaborating a programme of study that both contained Melanchthonian elements and yet was also clearly his own. Amongst the activities and doctrines promoted at Tycho's observatory and 'research institute', Uraniborg, were observational reform of astronomy through improved instrumentation; the pursuit of iatrochymical knowledge alongside knowledge of the heavens; the (occasional) recourse to scripture as a route to knowledge of nature; the rejection of both a Copernican account of the universe and traditional notions of celestial spheres; and the study of celestial novelties, that is comets and novae.¹² The focus here is on two 'graduates' of that programme who achieved a particular prominence in post-Reformation Scandinavia: Cort Aslaksson, or Cunradus Aslacus, as his name was Latinised; and the second-best known of Tycho's assistants, after Kepler, Christian Sorenson of Lomborg, better known as Longomontanus. Both took up positions at the University of Copenhagen: Aslaksson as professor of Latin (1600), Greek (1602), and Hebrew (1606), then Theology from 1607; Longomontanus as professor of mathematics in 1607, and then of superior mathematics (astronomy) in 1621. Both authored texts closely associated with Tycho and his project: Aslaksson the *De natura caeli triplicis*, produced during Tycho's lifetime in 1597 and dedicated to him; and Longomontanus the *Astronomia Danica*, published in 1622.¹³ These publications, amongst others by the same authors, can profitably be studied to shed light on the continued existence and further evolution in Denmark of astronomical Philippism.

Earlier scholarship on these individuals and on these works as representatives of the Tyconic programme in Denmark is scarce, but does exist. In 1972, in considering 'How Copernicanism took root in Denmark and Norway', Kristian P. Moesgaard described Aslaksson's *De natura caeli triplicis* as presenting a Tyconian philosophy and theology, including a Tycho-Aristotelian cosmology, which found acceptance and influence through being

reformulated and propagated by Caspar Bartholin.¹⁴ In the same article, he characterised Longomontanus's *Astronomia Danica* as a more traditional work of Tychonian astronomy, albeit one containing a Tycho-Copernican rather than a strictly Tychonian world system.¹⁵ Moesgaard used the word 'Tycho-nian' where others might prefer 'Tychonic'; but there is perhaps something to be gained from employing both of these terms, restricting Tychonic to doctrines and methods strictly in accordance with Tycho's own, and Tycho-nian for ones that are in keeping with the spirit but not the letter of Tycho's approach and ideas.

Of course, the distinction between the Tychonic and the Tychonian is not always very clear. In the case of Tycho's alchemical pursuits and the way they informed his cosmology, little enough is known directly about his practices and principles that much must instead be inferred from Tycho's close association with the Paracelsian physicians Johannes Pratensis and Petrus Severinus.¹⁶ Jole Shackelford has studied the texts of both Aslakssøn and Longomontanus for evidence of Paracelsian doctrine as mediated by Severinus's work – a task made easier in Aslakssøn's case by that fact that his *De natura caeli triplicis* not only makes several references to chymists and the *ars spagyrica*, but openly quotes Severinus's *Idea Medicinae* (1571) as a source.¹⁷ Shackelford and Ole Peter Grell have differed somewhat about the correct interpretation of Aslakssøn's apparent Paracelsianism within the context of the theological struggles in early-seventeenth-century Denmark, Aslakssøn also being known for successfully evading the attempts of Hans Poulsen Resen to eject moderate Lutherans such as himself from church and university positions. This conflict, Grell has argued, was not a direct Danish translation of the German struggle between strict gnesio-Lutherans and moderate Philippists, but rather an attempt to impose religious uniformity for political reasons; and it was Aslakssøn's supposed crypto-Calvinism, rather than his Paracelsianism, that caused concern in university circles.¹⁸ Shackelford has countered with the suggestion that, in early-seventeenth-century Denmark, the dividing line between theological Philippism and Paracelsianism is not so easily discerned.¹⁹ In his account, the fortunes of the two were closely intertwined.

This chapter will not attempt to resolve that dispute, which is most consequential in any case for understanding the Paracelsianism (or lack of it), of other Scandinavian scholars, most notably Ole Worm. Since, however, despite the difficulty of defining Tycho's own alchemical beliefs, an alchemically informed cosmology remains one of the legacies likely bequeathed by Tycho to his assistants, in what follows I shall try to explore these and other elements in their scholarship by means of a close reading of their texts with eyes well-attuned to Tycho's concerns. As well as making some remarks about the genres and audience for the writings of Aslakssøn and Longomontanus, I shall approach them addressing issues of epistemology, doctrine, and sources, and try thereby to assess their Tychonic and Tychonian credentials. I shall close with some remarks on what light, if any, such investigation sheds on the understanding of Philippist astronomy and cosmology, in Scandinavia and elsewhere.

Aslaksson on the nature of the threefold heaven

Aslaksson's *De natura caeli triplicis* is a curious work. Published in 1597, it appeared during Tycho's lifetime and was dedicated to him, but after Aslaksson had left Uraniborg and his service. Aslaksson (1564–1624) had worked there for less than three years, from October 1590 to April 1593; having obtained his MA at Copenhagen in May 1593, and receiving the *stipendium regium* to study abroad, he departed from Denmark for six years, serving as tutor to two Danish noblemen, one of them Tycho's nephew.²⁰ Amongst the institutions at which Aslaksson and his charges spent time was the Reformed Herborn Academy, which for a brief period in the 1590s was located at Siegen rather than Herborn itself. It was at Siegen that Aslaksson's work was published, and in the dedication, written at Basle, Aslaksson claimed to have 'begun to meditate and write' on 'the nature of heaven' a little under two years previously, whilst at the Academy.²¹ The dedication explicitly reveals the author's debt not only to Tycho but also to the Herborn faculty, notably the co-founder and leading light, Johannes Piscator, and one of the professors, Johann Heinrich Bisterfeld. These men, and the Marburg philosopher Rudolph Goclenius, all Calvinists, are credited with reading the work and suggesting improvements.²²

With respect to its pedagogic orientation and curriculum, Howard Hotson has characterised the Herborn Academy as Philippo-Ramist.²³ In other words, what was taught and studied there drew on the textbook traditions and pedagogy of both Ramus and Melanchthon. That the semi-Ramism of Piscator and his academy informed Aslaksson's scholarship becomes evident just after the dedication of the *De natura caeli triplicis*, where there appears a 'Synopsis Methodica' setting out the nature and subject-matter of the work as a dichotomous table. The prose of the main text is also prone to dichotomous distinctions.²⁴ It is clear, therefore, that the work was shaped by more than Tycho's training and agenda; in that very broad sense, it was a Tychonian, rather than a Tychonic, volume.

The 'threefold heaven' in the title is a reference to the three distinct 'heavens' treated by the text: the airy heaven of the sublunary world, the starry heaven, and the perpetual heaven of the afterlife. Again, to begin with a single term 'heaven' and to analyse it in its various senses is suggestive of a Ramist methodical approach, rather than a Tychonic one – and at first sight it might be thought, in book three, to have led Aslaksson into a place where Tycho himself was not usually inclined to go, the realm of explicit theology. In this part of the work, Aslaksson argues that the heaven of the blessed is a created, finite, and corporeal place – corporeal because the human nature of Christ and the elect are themselves corporeal, and therefore require a corporeal abode.²⁵ In the afterlife, Aslaksson asserts, humans possess bodies that are eternal and incorruptible, but are bodies nevertheless.²⁶ Consequently, his discussion in this book retains something of a natural philosophical character – or at least, it addresses a theology in which theories of place, space, and body play a key role.

Whether Tycho's mentoring of Aslaksson played any part in the formation of these views is difficult to tell. As Caroline Bynum Walker has shown, concern with the resurrection of the body formed a powerful strand of patristic and medieval thought, and a materialistic conception of the afterlife came to dominate theological discussion in the twelfth and early thirteenth centuries.²⁷ However, the late-medieval doctrine of purgatory helped to focus attention away from the body at resurrection and onto the postmortem experiences of the separated soul, divided from the body.²⁸ As well as denying the existence of purgatory, Luther rejected the idea that death produced a separated soul capable of sensation and consciousness; his doctrine of 'the sleep of the soul' was that the souls as well as the bodies of the dead remained insensate and unaware until the day of resurrection.²⁹ Thus Lutheran eschatology emphasised the rising of body-and-soul together, and therefore strongly implied, at the very least, the corporeality of the afterlife. Up to a point, therefore, this part of *De natura caeli triplicis* appears to have articulated nothing more than standard evangelical theology.

The physical status of the postmortem human body, however, was never by itself of great importance to Luther or to Lutheran theology; the status of Christ's resurrected body, on the other hand, was. Insistence on the corporeality of Christ's glorified body was used by opponents of Luther's understanding of the Lord's Supper, in conjunction with the multiple scriptural references to him sitting at the right hand of God, to deny that Christ's human body and blood could be really present during the Eucharist, as a literal interpretation of the words of institution seemed to require.³⁰ And Aslaksson's remarks about Christ's eternal body appear, at least in the opinion of Jole Shackelford, to deny it the ubiquity that strict Lutheran doctrine required.³¹ The critical passages of the text are ambiguous, probably intentionally so. They comprise quotation of biblical passages and late-antique authorities – Augustine of Hippo, Cyril of Alexandria, and Vigilius of Trent – that distinguish between Christ's divine and human nature and the availability of each to the believer, and close with the Augustinian admonition that it is not for us to inquire into the secrets of heaven.³² Such equivocation amidst the late-sixteenth-century struggles for doctrinal clarity does indeed, on balance, savour of (Lutheran) heresy – although whether any *contemporary* reader of the work objected to it on such grounds remains unclear. Moreover, as Dane T. Daniel has shown, the concept of the eternal body – part of the creation of God the Son, and bestowed on mankind by his sacrifice – was central to the theology and cosmology of Paracelsus.³³ The content of book three of Aslaksson's work could be seen as stemming, therefore, from his Philippist theology *or* his Paracelsianism – or indeed, their conjunction as Philippist Paracelsianism or Paracelsian Philippism – and could perhaps, therefore, have been nurtured on Hven.³⁴

Evidence of the Tychonian character of books one and two of the *De natura caeli triplicis* is much less ambiguous. Aslaksson's work as a whole is systematic (and *methodical*) without being exhaustive or encyclopaedic – as indeed suits its titular designation as three *libelli* rather than *libri*. Thus, in book one, on the airy

heaven, Aslaksson does not present a meteorology, but is concerned to address certain questions about what is – and what is not – part of the sublunary atmosphere. Hence chapter four of this section of the work contains the eminently Tychonic doctrine that there is no sphere of elemental fire above the air and below the moon; or rather, indeed, that there is no such thing as elemental fire.³⁵ In this passage, Aslaksson follows Tycho in *rejecting* what he took to be the view of Paracelsus, that the heavens were fiery.³⁶ The longer book two, on the starry heaven, contains extensive discussion of what we can also recognise as Tychonic doctrines: the claim that the starry heaven is fluid, but in no way elemental, rather being ethereal; that there is, however, some kind of relationship between heaven and the earth; that the presence of comets in the heaven is evidence of its fluidity; that the planets move through this fluid heaven, freely; and that they are not moved by any celestial orbs or external intelligences, but are furnished with a divinely endowed knowledge of their courses.³⁷ The latter claim enabled Aslaksson, as it had Tycho, to explain the lawlike-regularity of the heavenly motions so fundamental to Melanchthon's promotion of astronomy, despite having done away with the celestial apparatus that traditionally explained them – and to do so, moreover, in a way that could only strengthen the inference from visible phenomena to invisible Creator, and thereby from natural order to moral order and political stability.³⁸ There is perhaps an echo in it, too, of the innate knowledge, divinely endowed on the *human* mind, that underpinned Philippist epistemology and moral philosophy.³⁹

There is no mathematical astronomy as such in book two, and little that relates directly to the debate over world systems. Aslaksson's twentieth-century biographer, Oskar Garstein, characterised the work as a synthesis of the theories of Copernicus and Tycho, and asserted that it in Aslaksson adopted the world system of Copernicus.⁴⁰ This verdict appears to stem from his reading of the argument of chapter twenty-three of book two, that 'The starry heaven is immobile'.⁴¹ It is true that in this chapter Aslaksson refers to Copernicus's explanation of the apparent diurnal rotation of the heavens through attribution of a daily rotation to the Earth. Yet he did not wholeheartedly endorse the Copernican theory, asserting rather that it solved one absurdity, the attribution of rapid motion to a most fluid substance – which by its very nature, he argued, was incapable of carrying around with it the planets – at the cost of another.⁴² Aslaksson is not concerned in this chapter with explaining the apparent daily motion of the planets, or indeed that of the fixed stars; he seeks only to deny that the phenomena indicated that the fluid substance of the heavens was itself in motion. Like Tycho, he argues that the planets moved by themselves through the fluid heavens; unlike his mentor, he hints that their apparent motion in the sky *was* their proper motion, and not a composite of their own motion and a diurnal motion to be attributed to the rotation of either the heavens as a whole or, as Copernicus had argued, the Earth.⁴³

Of the other chapters of this book, the first is particularly noteworthy for its account of how knowledge of the starry heaven can be obtained. The means by which knowledge of heaven can be acquired fall into two categories, Aslaksson

argues: those that are common to acquiring knowledge of the stars as well as of heaven, and those that are specific to either the stars or the heavens. In the former category, he places, in order: scripture, then philosophy, and in particular the science of optics. The latter category he subdivides into observations and hypotheses. For observations, he states, geometry and arithmetic are necessary aids, with geometry subdivided into a mechanical part, dealing with instruments, and a metrical part, dealing especially with what we would now think of as trigonometry.⁴⁴

Much of this is identifiably Tychonic. That Aslakssøn should have emphasised the importance of optics, and categorised it with philosophy rather than geometry, fits with the inferences made by Tycho and his correspondent Christoph Rothmann in debates about refraction and the distinction – or lack of such – between air and aether.⁴⁵ Aslakssøn cites their epistolary exchanges in his work;⁴⁶ and he sides with Tycho in arguing that the lack of refraction at the boundary between the two does not reveal that air and aether are one and the same substance.⁴⁷ Unlike Tycho, however, Aslakssøn appears to have found a copy of the edition of Euclid's optics by Ramus's disciple Johannes Pena, an important source for optical arguments about the substance of the heavens, and one for which Tycho himself searched in vain into the 1590s.⁴⁸ In the section on instruments, Aslakssøn emphasises quadrants and sextants – as, at this time, only someone familiar with the observatories at either Uraniborg or Kassel would do – and when describing their use in establishing the celestial phenomena precisely, mentions the 'Atlas-like' Tycho by name.⁴⁹ And when it comes to explicating 'hypotheses', Aslakssøn notes the shifting understanding of this term from whatever mathematical device serves to save the celestial appearances to, in particular, collections of such devices in the form of planetary systems, of which he considered there to be three: the Ptolemaic, the Copernican, and the Tychonic.⁵⁰ This is all precocious stuff for 1597, given the limited circulation of Tycho's own publications before this point in time;⁵¹ it is not too surprising for an alumnus of Uraniborg, but clear evidence nevertheless of Aslakssøn's Tychonic credentials.

What, however, should we make of Aslakssøn's identification of scripture as the *first* source of knowledge of the starry heaven? It is wholly consistent with Aslakssøn's treatment of the *three* heavens in this work, and with his emphasis on scripture as the sole source of knowledge of the perpetual heaven.⁵² And it is consistent with his later authorship of the *Physica et ethica Mosaica*, a natural and moral philosophy based on exegesis of the first three chapters of *Genesis* – a work that recapitulates some of the material in the *De natura caeli triplicis*.⁵³ (As Ann Blair has noted, this work resembles the biblical commentary tradition, with scripture affording Aslakssøn an opportunity to set out his existing views, rather than forcing him to develop new ones, systematically).⁵⁴ But how Tychonic or even Tychonian is it? Though invoked to some extent in his rejection of Copernicanism, in conjunction with other arguments, Tycho's commitment to the Bible as a real source of cosmological knowledge is elusive in his own publications and much of his correspondence.

One author who has considered the issue in some depth is Kenneth J. Howell.⁵⁵ Yet consideration of Aslaksson's text raises the question of whether what Howell takes to be Tycho's position is fully his own. One of the sources Howell considers is a 1590 letter sent by Tycho to Caspar Peucer, responding to a letter of May 1589 in which Peucer challenged Tycho about aspects of his cosmology. A particular issue raised by Peucer in his letter, and addressed in Tycho's reply, was the nature of the supposedly 'supracelestial waters' – the waters *above* the firmament divided from the *waters* below, according to Genesis chapter 1.⁵⁶ Answering Peucer, Tycho rejected the suggestion that these waters lay above the celestial bodies, perhaps even constituting the adamantine sphere separating the heaven of the beatific vision from the mortal world; they should be interpreted instead, his letter asserted, as water in the airy atmosphere, in the form of clouds and vapours.⁵⁷

This topic is one that Aslaksson addresses too, in books one and two of his work, using similar arguments, and reaching the same conclusions; these sections of his treatise could perhaps be interpreted as an elaboration of Tycho's letter to Peucer. Thus, whereas Tycho's letter cites Calvin amongst the theologians who share his view, Aslaksson actually quotes Calvin's commentary on *Genesis*.⁵⁸ Whereas Tycho's letter shows a passing acquaintance with resources such as Sebastian Castellio's Latin Bible, the Hebrew lexicon of Santes Pagninus, and the Bible of Immanuel Tremellius and Franciscus Junius, Aslaksson's work shows extensive familiarity with these and with other texts relevant to exegetical philosophy, such as the *Physica Christiana* (1576) of Lambertus Danaeus and Hieronymus Zanchius's *De operibus Dei intra spacium sex dierum creatis opus* (1591).⁵⁹ And Aslaksson certainly knew of Tycho's letter; he cited it in the *De natura caeli triplicis* in support of a particular point about the integrity of celestial bodies.⁶⁰

Many things could explain Aslaksson's familiarity with Tycho's 1590 letter to Peucer, and the congruence between the views it expresses and exegetical strategies it employs, and his own, apparently enduring, methods and beliefs. Given Tycho's self-conscious use of his own correspondence in publicising his work, managing his reputation, and advancing his programme, Aslaksson's might well have been called upon, during his service on Hven, to make one or more copies of the letter for wider circulation, or to prepare it for printing.⁶¹ He might even, for the same reasons, have obtained a copy of it elsewhere, after leaving Uraniborg.⁶² Yet it is worth noting that the precise date of the letter is unknown, and it is not impossible that it was written whilst Aslaksson was on Hven, and perhaps even with his assistance.

From his placement of the letter within Tycho's *Opera omnia*, it can be inferred that J.L.E. Dreyer supposed that it was written in February 1590, several months before Aslaksson came to Uraniborg. Yet the evidence of the letter itself suggests a later composition. It responds to Peucer's letter to Tycho of 10 May 1589 and to another later and shorter letter from Peucer, no longer extant, delivered to Tycho by the French diplomat Jacques Bongars. Tycho received the first of these letters shortly before the summer solstice, when he attended the

herredag, the annual assembly of Danish nobility on the mainland, and resolved to write his reply once he returned to Uraniborg; he received the second letter when passing through Copenhagen, on this or another occasion.⁶³ Bongars agreed to act as the courier for Tycho's reply to Peucer, but then failed to come to Hven, to carry out this promise, through the whole of the following summer; the letter was thus a long-delayed response to Peucer, ostensibly for this reason.⁶⁴ Thus far, if we assume that the summer solstice in question was 1589 rather than 1590, all these details are compatible with a February composition. In addition, however, the letter shows that Tycho inferred, from Peucer's failure to mention it in his epistles, that he had not yet received an 'apologetic writing', which Tycho had also sent to him for his inspection and approval.⁶⁵ From other letters of this period, it is clear that 'apologetic writing' is a reference to Tycho's defence of his views on comets against the criticisms of his Aristotelian correspondent John Craig, a text that he did not finish composing – and hence did not begin to send out to correspondents – until October 1589.⁶⁶ Clearly, Tycho could not have reasonably expected to find mention of this work in Peucer's letters unless he received at least one of them – the one carried by Bongars – some time after that date. A whole summer having passed after *that*, then, would seem to imply that the letter was written no earlier than the autumn or winter of 1590. And, as noted above, Aslakssøn started at Uraniborg in October of that year.

Given both the deeply collaborative nature of Tycho's astronomical enterprise, and the extent to which he nevertheless took credit for the work carried out by his assistants, it would not be surprising, I think, if his correspondence turned out to sometimes be the product of more hands and minds than has hitherto been realised.⁶⁷ Tycho certainly appreciated that there was much at stake in corresponding with Caspar Peucer – the son-in-law of Melanchthon, and guardian of his reputation, and the most visible casualty of the struggle in Saxony between the gnesio-Lutherans and the Philippists.⁶⁸ Thus, in composing his response to Peucer's letter of May 1589, Tycho might well have thought it prudent to draw on the expertise of a bright young Copenhagen-trained theologian-in-the making (were one to hand), particularly since he proposed to disagree with many of Peucer's scripturally based cosmological claims. Thus, if Aslakssøn's later work is capable of being read as the fuller expression of a Tychonic or Tychonian cosmology, partly rooted in skilled exegesis, whose seeds were contained within the letter of 1590, that may well be because the letter was one that he helped to write. But even if he did not contribute to the letter's composition, the echo of its contents in the *De natura caeli triplicis* show just how formative his time at Uraniborg was in shaping Aslakssøn's cosmology.

Longomontanus's Danish astronomy

In contrast to Aslakssøn, Longomontanus (1562–1647) was one of the longest serving of Tycho's assistants. Although the exact date of his arrival on Hven is not recorded, we know that he began work at Uraniborg in 1589 and stayed there

until Tycho's own departure in early 1597; he left Tycho's service with a letter of recommendation dated 1 June of that year. After some years of peripatetic study, he rejoined Tycho in Bohemia in January 1600, having failed to secure a satisfactory position on his own account. He departed Prague with another letter of recommendation several months later, little more than a year before Tycho died.⁶⁹ As several historians have suggested, it is likely that he, rather than Kepler, would have been Tycho's preferred successor, not least because he was a skilled observational astronomer and mathematician who made significant contributions to the technical astronomy published under Tycho's name.⁷⁰ Thus, as N.M. Swerdlow has recently discussed, he was largely responsible for the lunar theory which appeared in Tycho's posthumous *Astronomiae instauratae progymnasmata* (1602); he published a revised version of this theory in his *Astronomia Danica* of 1622.⁷¹

The *Astronomia Danica* itself has been variously described. Kristiaan P. Moesgaard, for example, labelled it a systematic treatment of astronomy largely based on Ptolemy and Copernicus, while John Christianson has referred to it as a 'great summary of Tychonic astronomy'.⁷² The work was certainly both systematic and Tychonic – and thereby largely dependent, as Tycho's was, on variants of the mathematical models of Ptolemy and Copernicus. But such descriptions do not entirely capture the notable features of this work, or explain how and why it deviated from the Tychonic enterprise on which it was based.

In September 1588 Tycho had outlined – again in a letter to Caspar Peucer – the systematic work of astronomy that he proposed to produce, in seven parts. This would treat (i) the instruments of astronomy, (ii) trigonometry and other necessary mathematical aids, (iii) the sphere of fixed stars, (iv) the Sun and the Moon (v) the longitudes of inferior planets Venus and Mercury (vi) those of the superior planets, Mars, Jupiter, and Saturn, and (vii) the latitudes of all of the planets. Treating these topics, in this order, would provide a substitute for the great works of Ptolemy and Copernicus, which also dealt with the celestial bodies, but (so Tycho asserted) not sufficiently systematically, because they did not begin with a discussion of astronomical instruments and mathematics.⁷³ Partly because of the time and effort he spent dealing with a topic not included in this list, the recent novel phenomena of the heavens – in the form of the nova of 1572 and various comets – Tycho did not succeed in producing such a work himself.⁷⁴ But neither, quite, did Longomontanus, even if the *Astronomia Danica* contains many of its elements. Rather than being modelled on, and thereby substituting for, Ptolemy's *Almagest* or Copernicus's *De revolutionibus*, with Tychonic modifications, Longomontanus's *magnum opus* takes its cue from the basic university textbooks in astronomy, the *De Sphaera* and the *Theoricae Planetarum*.⁷⁵ Thus, the work is divided into two parts, with part one devoted to spherical astronomy and part two to the planets. The newly fashionable topic outside the academies, new phenomena in the heavens, is relegated to an appendix.

The work as a whole has the character of a textbook, albeit one for advanced students; it contains frequent references to 'novices' and 'youths' and copious

worked examples. Trigonometry and instruments are treated within it as important foundations for astronomy, as Tycho had suggested, but not quite in the way that he outlined. Thus trigonometry appears as one of two *prognorismata*, or prior distinguishing marks of astronomy, preceding the first part of the work, on spherics.⁷⁶ Observational instruments receive an extended treatment in chapter seven of book two of part one, with Longomontanus explaining that ‘without this knowledge, no-one becomes an expert in our astronomy’.⁷⁷ But pedagogic concerns and the appropriation of the *sphaera* genre, at least in part, led Longomontanus to treat as the most fundamental astronomical instrument not any of the sophisticated devices developed and used at Uraniborg, but rather the demonstrational armillary sphere, the *sphaera materialis*. This is introduced in chapter two of book one of part one, as a general instrument for delineating the apparent celestial motions, with its representational significance emphasised in the following three chapters.⁷⁸ Then, when he subsequently turns to instruments for observation, in chapter seven of book two, he notes that almost all such instruments could be considered parts of the material sphere he has already described.⁷⁹

A Copenhagen disputation presided over by Longomontanus in 1612, and subsequently published, also focused on the *sphaera materialis*; it shares some of its content with the *Astronomia Danica*, including its labelled diagram of the instrument.⁸⁰ In this avowedly *philosophical* disputation, the claim that astronomy is the most noble part of philosophy – save for metaphysics – is openly made.⁸¹ Such status-raising moves on the part of academic writers on astronomy were conventional, and not confessionally unique; in competition for prestige with professors of other disciplines, mathematicians had good reason to lay claim to the superior nature of their objects of study, such as their perfection and proximity to the divine, or the greater certainty of their methods. But there is no reason to suppose that they were not also sincere, nor that they were not tuned by particular pedagogic traditions and beliefs.⁸² Melanchthon’s emphasis on the particular value of the celestial motions as testimony to divine Providence (itself an echo of ancient opinion), justifying consideration of them as part of natural philosophy and not only mathematics,⁸³ is re-expressed here in the claim that astronomy reveals ‘a harmony of order and motions, clearly divine, on which many metaphysical traces have been impressed, to the extent that you should declare heaven the opened book not only of Nature, but also of the whole Universe’.⁸⁴

The contrast between ‘Nature’ and the ‘whole Universe’ implies that for Longomontanus, as for his Philippist predecessors, there was more at stake in studying the stars and planets even than the claim of astronomers to be able to supply knowledge of the physical world.

In the *Astronomia Danica*, too, the importance of the distinction from natural philosophy is evident both in the extent to which it is adhered to, and the extent to which it is carefully undermined. Whereas in Aslakssøn’s book the authorities cited included a range of natural philosophers and theologians, those named by Longomontanus are principally the classical authors

and astronomers appropriate for inclusion in a work of mathematics: Hesiod, Pliny, Ovid, Ptolemy, Albategni, Regiomontanus, Copernicus, Reinhold, Tycho, Kepler, and the like. Philosophers feature more rarely: Plato and Plotinus receive the occasional honourable mention; Aristotle appears mainly to be castigated for his erroneous views. Much of this resembles Tycho's major publications, but the *Astronomia Danica* also contains genre-busting elements of a non-Tychonic kind. Whereas Tycho's own scholarly but non-academic works tended to strategically separate astronomy and astrology, increasingly so in his later years, Longomontanus interwove mathematical astrology into his text, something that was relatively unusual for the academic genres on which it was based.⁸⁵ The inclusion of sections and aspects in the introductory chapters on spherics could perhaps be explained by the requirements of the Copenhagen curriculum, but not the horoscopic analyses of the comets of 1607 and 1618 in the *Astronomia Danica*'s appendix.⁸⁶ Thus, Longomontanus seems not to have inherited Tycho's doubts about the traditional *practices* of astrology – but not concerning the principle of celestial causation which justified the treatment of astrology as physics, for about that Tycho had none.

On two important cosmological topics, Longomontanus differentiated himself from his former master in interesting ways. First, in advocating a modified form of his master's world system, in which the Earth remained at the centre of the universe but rotated once every twenty-four hours, Longomontanus almost casually asserted the necessity of an accommodationist reading of the Bible. No one should wish to attribute real motions to the fixed stars, he suggested, 'except one who mordantly wishes to uphold sacred scripture in a few places, and not (as they seem to be) apparently accommodated to human intellect'.⁸⁷ True, he also invoked scripture in rejecting the Copernican proposition that the Earth was not created at the centre of the universe.⁸⁸ But, at the same time, he gave considerable weight to Tycho's arguments based on the disproportionality of the Copernican system – a result of the enlargement of the distance between the planets and the stars, and the consequent increase in size of the latter, which having the Earth in motion around the Sun would necessarily require.⁸⁹ Although his world system was Tychonian, rather than Tychonic, the reasoning that he employed to justify his choice might be thought to shed some light on Tycho's own weighting of scriptural exegesis vis-à-vis considerations of physical geometry. In other words, Longomontanus's work can be used to suggest that Tycho, too, had recourse to scripture to confirm beliefs formed by pursuing other modes of inquiry, and not the other way round. This is not to argue that either scholar was insincere in pointing to the Bible as a source of cosmological knowledge; both evidently felt that there could be no incompatibility between the Bible, properly understood, and the results of their astronomical labour. But given the susceptibility of the text to differing interpretations, which Longomontanus at least acknowledged,⁹⁰ it is difficult to see how they could have used it to *arrive* at their very particular views without the use of other evidence.

The second cosmological issue whose treatment in the *Astronomia Danica* is significant concerns the nature of celestial matter. This was the subject of

the second the two *progorismata* preceding the first part of the work on spherics – and hence, in Longomontanus’s presentation, a topic fundamental to the understanding of astronomy.⁹¹ Longomontanus’s treatment is similar in several respects to the second book of Aslaksson’s *De natura caeli triplicis*. Thus Longomontanus is at pains to explain here that the celestial region is unencumbered by physical orbs or spheres, and not fiery in nature, but occupied by a fluid substance distinct in nature from elemental water and air.⁹² But he then goes on to present some rich reflections about this substance, Tychonian rather than Tychonic in character, which draw on scripture, on chymical authors, and on optical evidence.⁹³ A key argument offered here is that the substance of the heavens is not, as the scholastics had argued, without contrary qualities. As experience and experiment suggest, the light-producing bodies of the cosmos, especially the sun, generate and disseminate heat; thus, Longomontanus argues, it makes sense that the *expansum* which fills the space between such bodies, constitutes the substance through which they pass, and acts as the luminiferous medium, possesses the opposite quality of cold.⁹⁴ Longomontanus’s account of this substance is interesting for two reasons. First, the term ‘expansum’ is one employed Tycho’s epistolary exchanges with Peucer, as a suitable translation for the Hebrew *raqia*; this allowed Tycho to claim that scripture supported the idea that the heavens were fluid.⁹⁵ Second, Longomontanus’s *expansum* possesses the property of ubiquity: it extends throughout the universe, occupying terrestrial as well as celestial space, and constituting the medium for light and other celestial rays even beneath the surface of the Earth, and is ‘most tenuous and subtle, nay indeed akin to incorporeal and insensible’; if ‘anyone said it were relatively spiritual, and to be likened to the fifth essence of Aristotle, he would, in my judgement, not be far from the truth’.⁹⁶ Though Longomontanus himself does not emphasise it, his discussion here therefore touches on (and equivocates over) the issue at stake in the great Christological debate of the Protestants: could a corporeal substance be everywhere, or was a ubiquitous substance necessarily spiritual?

Longomontanus refers back to his theory of celestial matter in his brief appendix on celestial novelties. This appendix is conventional in a number of ways. It analyses comets and novae in terms of the four scholastic causes – efficient, material, formal, and final – as a number of works of natural philosophy did from the late middle ages onwards.⁹⁷ It presents them in a very traditional sense, as portents of terrible things, but with the Philippist refinement (subsequently distributed across confessional boundaries), that these were signs intended by God to encourage sinners to repent.⁹⁸ And it seeks to explain, again, in a way that accords with Philippist understanding, that because God’s providential governance of his creation operates through secondary causes, there is no contradiction between the natural and the eschatological explanations of their purpose.⁹⁹

In discussing the efficient and the material causes of comets, Longomontanus reports on the pious ignorance of their true nature that had increasingly become the norm in the later sixteenth century, as the Aristotelian explanation

of them as meteorological phenomena began to seem more and more untenable. Tycho himself, he notes, had agreed with the Imperial Physician Thaddaeus Hagecius that *how* comets were generated in heaven was to be ascribed ‘to the marvellous Works of God’ and considered something that ‘is removed from our fuller knowledge’, even as he pledged to set out his opinion on their creation at the close of his three-volume work on new phenomena in the heavens.¹⁰⁰ Tycho did not live to fulfil this promise, though he dropped a few broad hints at the close of his *Astronomiae instauratae progymnasmata*, where he likened comets to the nova of 1572.¹⁰¹ Thus Longomontanus was free to offer, and claim credit for, some speculations of his own. Like Tycho, Longomontanus saw a connection between the matter of comets and novae and the Milky Way.¹⁰² Unlike him, however, he sought to connect the coming-to-be and passing away of such phenomena in the heavens to the existence of the contrary qualities, heat and cold, which he had, without direct precedent, located in the celestial realm. His explanation likens celestial generation to processes at work in terrestrial procreation: occupying a domain considered by him to be subject to material change, the heavenly bodies are capable, he argues, at times determined by divine providence – and thus, far from randomly – of producing invisible *semina*. These seeds, embedded in the *expansum*, develop into the visible celestial phenomena, novae and comets, in a process akin to the reproduction of animals and the propagation of plants.¹⁰³ As Jole Shackelford has noted, the seminal theory of generation underpinning this account can be traced back to Paracelsian theories, as articulated by Petrus Severinus, and can also be found in Aslaksson’s work.¹⁰⁴ Thus in its matter theory, as well as its focus on novel celestial phenomena, the Appendix testifies to the common cosmological inheritance of Tycho’s Scandinavian disciples. Yet, if we are to believe Longomontanus himself, his use of this inheritance in this instance was Tychonian rather than Tychonic, since it elaborated a fuller theory of cometary generation than Tycho himself had presented.¹⁰⁵

Conclusion

The two works that I have examined, by two of Tycho’s assistants who went on to enjoy important careers within Denmark, show clear signs of having been shaped by their authors’ experiences in Tycho’s employ. They are, in certain identifiable respects, Tychonic. But they are not narrowly so, and it is certainly too limited a view to see the author of one, Aslaksson, as one of Tycho’s philosophical and theological heirs, and the author of the other, Longomontanus, as Tycho’s astronomical heir. Both works were certainly also shaped by their authors’ subsequent educational experiences and settings, as well as their particular talents and concerns. Since they present inflected forms of what might we might think of as a Tychonic tradition or school of approaching the study of the heavens, with their authors deviating slightly from Tycho’s own modes of enquiry, doctrines, and context, we might label them Tychonian.

To be Tychonian in Denmark at the turn of the century was also, however, to belong to a longer Philippist tradition of studying the heavens. That too is evidenced by the texts in question, even if, bearing Charlotte Methuen's caveats in mind, it seems possible only to point to material that seems *characteristic* of the legacy of Melanchthon, and not to anything *unique* to astronomical Philippism, or indeed the Lutheran confession more generally. To the extent that both Aslakssøn and Longomontanus subscribed to cosmologies informed by Paracelsian theories of matter and generation, as Tycho too had done, the evaluation of their confessional credentials is complicated by the existing historiography concerning the relationship between Lutheran orthodoxy, Philippism, and Severinian Paracelsianism in early seventeenth-century Denmark. But the search for doctrinal specificity in the Melanchthonian astronomical tradition seems to me misguided, on a number of grounds. Theologically, Philippists were not always clearly distinguishable from Calvinists, and they have typically been identified with a degree of irenicism and openness lacking in their 'hardline' Lutheran opponents; the very aspiration to doctrinal clarity was something that, in a sense, the gnesio-Lutherans used against them, rather than something to which they wholly subscribed. Moreover, successive generations of astronomical Philippists worked with, and indeed made substantial contributions to, a changing body of knowledge, using different methods and techniques. At the start of the Reformation, for example, comets were predominantly thought of as meteorological phenomena; by the end of the sixteenth century, the leading Lutheran astronomers had come to believe that they were wholly celestial phenomena. Some of them had developed, and applied to this study, new instrumentation of unprecedented accuracy. But while understanding of both their *physical* nature and the mode of inquiring into their location had thus been radically transformed, appreciation of their *eschatological* significance as divinely ordained calls to repent was widely retained. It is these continuities and changes within the multi-generational tradition of astronomical Philippism that we must describe and explain.

There is still more work to be done, I think, to draw out the astronomical and cosmological thought of both Aslakssøn and Longomontanus, and thereby to bring them out of the shadow of their master and collaborator. A fuller study of both authors' use of scriptural exegesis and the contemporary reception, or lack of one, accorded to their respective reflections on corporeality and ubiquity, would be helpful in clarifying the relationship between theological doctrines to which they were increasingly *supposed* to subscribe and their natural philosophies. Having said that, one of the reasons for pursuing such work is that sheds further light on Tycho himself. On the one hand, it raises some interesting questions about the contribution that Tycho's assistants made to work published or circulated under his name – questions that may not be fully answerable, but are certainly worth bearing in mind. On the other hand, considering Tycho, a member of the third-generation of Philippists, in the light of the work of those members of the fourth-generation that he helped to train, brings into relief aspects of his own work that may need to be rethought as reflecting traditional

concerns. Thus bookended, for example, Tycho's insistence that a systematic work of astronomy should first treat instruments and mathematics looks less a personal preference, and more like the kind of concern to establish the sources and foundations of astronomical knowledge that both Aslaksson and Longomontanus also displayed, as well as earlier Philippists and Johannes Kepler. As Nienke Roelants has suggested, such epistemological concerns may have their origins in Lutheran anthropology. The heavens had to be *knowable* to convey the lessons that Melanchthon and his followers sought to extract from them, despite the limitations placed on man's ability to know nature as a result of the Fall.

Notes

- 1 E.g. J. R. Christianson, 'Tycho Brahe's German Treatise on the Comet of 1577: A Study in Science and Politics', *Isis* 70 (1979), 110–140; Jole Shackelford, 'Providence, Power, and Cosmic Causality in Early Modern Astronomy: The Case of Tycho Brahe and Petrus Severinus', in John Christianson et al. (eds.), *Tycho Brahe and Prague: Crossroads of European Science* (Frankfurt am Main, 2002), 46–99; Håkon Håkansson, 'Tycho the Prophet: History, Astrology and the Apocalypse in Early Modern Science', in Kevin Killen and Peter J. Forshaw (eds.), *The Word and the World: Biblical Exegesis and Early Modern Science* (Basingstoke, 2007), 137–156; Adam Mosley, 'The Reformation of Astronomy', in Bridget Heal and Ole Peter Grell (eds.), *The Impact of the European Reformation* (Aldershot, 2008), 231–249.
- 2 See, *inter alia*, Lynn Thorndike, *A History of Magic and Experimental Science*, 8 vols. (New York, 1941), 6, 378–405; John Warwick Montgomery, 'Cross, Constellation and Crucible: Lutheran Astrology and Alchemy in the Age of the Reformation', *Ambix* 11 (1963), 65–86; Robert S. Westman, 'The Melanchthon Circle, Rheticus and the Wittenberg Interpretation of the Copernican Theory', *Isis* 66 (1975), 165–193; Charlotte Methuen, *Kepler's Tübingen: Stimulus to a Theological Mathematics* (Aldershot, 1998).
- 3 Peter Barker, 'The Role of Religion in the Lutheran Response to Copernicus', in Margaret J. Osler (ed.), *Rethinking the Scientific Revolution* (New York, 2000), 59–88; Peter Barker, 'The Lutheran Contribution to the Astronomical Revolution: Science and Religion in the Sixteenth Century', in John Brooke and Ekmeleddin Ihsanoglu (eds.), *Religious Values and the Rise of Science in Europe* (Istanbul, 2005), 31–62; Sachiko Kusukawa, 'The Natural Philosophy of Melanchthon and His Followers', *Sciences et Religions: De Copernic à Galilée (1540–1610)* (Rome, 1999), vol. 260, 443–453. Sachiko Kusukawa, 'Lutheran uses of Aristotle: a comparison between Jacob Schegk and Philip Melanchthon', in Sachiko Kusukawa and Constance Blackwell (eds.), *Philosophy in the Sixteenth and Seventeenth Centuries: Conversations with Aristotle* (Aldershot, 1999), 169–188, both offers arguments in favour of the existence of 'Lutheran natural philosophy' – understood as natural philosophy directed to Lutheran ends – and cautions against the expectation that it might take a single form, or be shared by all Lutherans.
- 4 Charlotte Methuen, 'On the Problem of Defining Lutheran Natural Philosophy', in John Brooke and Ekmeleddin Ihsanoglu (eds.), *Religious Values and the Rise of Science in Europe* (Istanbul, 2005), 63–80.
- 5 See, for example, Gábor Almási, 'Rethinking Sixteenth-Century "Lutheran Astronomy"', *Intellectual History Review* 24 (2014), 5–20, on 6–7; Robert Kolb, 'Dynamics of Party Conflict in the Saxon Late Reformation: Gnesio-Lutherans vs. Philippists', *Journal of Modern History* 49 (1977), supplement, D1289–D1305; Thorkild Lyby and Ole Peter Grell, 'The consolidation of Lutheranism in Denmark and Norway', in Ole Peter Grell (ed.), *The Scandinavian Reformation: From Evangelical Movement to Institutionalisation of Reform* (Cambridge, 1995), 114–143.

- 6 Methuen, 'On the Problem of Defining Lutheran Natural Philosophy', 72–75; Almási, 'Rethinking Sixteenth-Century "Lutheran Astronomy"'.
- 7 Nienke Roelants, *Lutheran Astronomers After the Fall (1540–1590): A Reappraisal of the Renaissance Dynamic Between Astronomy and Religion* (Ghent University, 2013). See also Peter Harrison, *The Fall of Man and the Foundations of Science* (Cambridge, 2007), 89–107.
- 8 Methuen, 'On the Problem of Defining Lutheran Natural Philosophy', 75–78.
- 9 Barker, however, has argued that doctrines of the ubiquity and Real Presence of Christ underpinned Lutheran attention to nature as a product of, and testament to, providential design. See his 'On the Role of Religion', 61–62. Like Almási, 'Rethinking Sixteenth-Century "Lutheran Astronomy"', 7–8, I remain unpersuaded by this argument on the basis of the evidence presented.
- 10 For the example of Niels Hemmingsen, dismissed from his chair in theology at the University of Copenhagen for this reason, see Lyby and Grell, 'The Consolidation of Lutheranism in Denmark and Norway', 120–122. For Kepler, see Max Caspar, *Kepler* (New York, 1993), 213–220, and Jürgen Hübner, *Die Theologie Johannes Keplers zwischen Orthodoxie und Naturwissenschaft* (Tübingen, 1975), especially 138–139.
- 11 Sachiko Kusukawa, *The Transformation of Natural Philosophy: The Case of Philip Melancthon* (Cambridge, 1995). For the expression of the resulting concerns – e.g., with nature as visible testimony of providential order, and with the refutation of Epicurean atheism and Stoic determinism – see Kusukawa (ed.) and Christine Salazar (tr.), *Philip Melancthon: Orations on Philosophy and Education* (Cambridge, 1999).
- 12 For this description of Uraniborg, see Victor E. Thoren, 'Tycho Brahe as the Dean of a Renaissance Research Institute', in Margaret J. Osler and Paul Lawrence Farber (eds.), *Religion, Science and Worldview: Essays in Honor of Richard S. Westfall* (Cambridge, 1985), 275–296. For Tycho's life and research programme more generally, see Victor E. Thoren, *The Lord of Uraniborg: A Biography of Tycho Brahe* (Cambridge, 1990) and John Robert Christianson, *On Tycho's Island: Tycho Brahe and His Assistants, 1570–1601* (Cambridge, 2000).
- 13 Cunradus Aslacus, *De natura caeli triplicis libelli tres* (Siegen: n. p., 1597); Christian Sørensen Longomontanus, *Astronomia Danica* (Amsterdam, 1622). In this and subsequent notes, I follow the title pages in citing Aslakssøn's works using the Latinised name 'Aslacus'.
- 14 K. P. Moesgaard, 'How Copernicanism took Root in Denmark and Norway', *Studia Copernicana* 5 (1972), 117–151, on 122.
- 15 Moesgaard, 'How Copernicanism took Root in Denmark and Norway', 126–134. See also his focused discussion of both authors in 'Cosmology in the Wake of Tycho Brahe's Astronomy', in W. Yourgrau and Allen D. Breck (eds.), *Cosmology, History and Theology* (New York and London, 1977), 295–305.
- 16 Jole Shackelford, *A Philosophical Path for Paracelsian Medicine: The Ideas, Intellectual Context, and Influence of Petrus Severinus (1540–1602)* (Copenhagen, 2004), 63–94.
- 17 Ibid., 318–323; Aslacus, *De natura caeli triplicis*, 100, 103. Shackelford plays particular attention to Aslakssøn in 'Rosicrucianism, Lutheran Orthodoxy, and the Rejection of Paracelsianism in Early Seventeenth-Century Denmark', *Bulletin of the History of Medicine* 70 (1996), 181–204, on 188–192, and 'Unification and the Chemistry of the Reformation', in Max Reinhart (ed.), *Infinite Boundaries: Order, Disorder, and Reorder in Early Modern German Culture* (Kirkville, MO, 1998), 291–312.
- 18 Ole Peter Grell, 'The Reception of Paracelsianism in Early Modern Lutheran Denmark: From Peter Severinus, the Dane, to Ole Worm', *Medical History* 39 (1995), 78–94, on 78, n. 4 and 86–88; Grell, 'The Acceptable Face of Paracelsianism: The Legacy of Idea Medicinae and the Introduction of Paracelsianism into Early Modern Denmark', in Ole Peter Grell (ed.), *Paracelsus: The Man and His Reputation, His Ideas and Their Transformation* (Leiden, 1998), 245–267, especially 256–259.
- 19 Shackelford, 'Rosicrucianism, Lutheran Orthodoxy, and the Rejection of Paracelsianism in Early Seventeenth-Century Denmark'; 'Unification and the Chemistry of the Reformation'; 'To Be or Not to Be a Paracelsian: Something Spagyric in the State of Denmark', in Gerhild Scholz Williams and Charles D. Gunnoe (eds.), *Paracelsian Moments:*

- Science, Medicine, and Astrology in Early Modern Europe* (Kirkville, MO, 2002), 35–69; ‘Paracelsianism and the Orthodox Lutheran Rejection of Vital Philosophy in Early Seventeenth-Century Denmark’, *Early Science and Medicine* 8 (2003), 210–252, especially 218–220 and 224–225.
- 20 Christianson, *On Tycho’s Island*, 252.
- 21 Aslacus, *De natura caeli triplicis*, 3: ‘Annus iam ferme secundus agitur . . . ex quo in illustrissima Schola Sigenensi, quae tum primo Herborna istuc translata est, quorundam instinctu & roagtu impulsus, de NATURA CAELI theses quasdam meditari & conscribere occoepe’.
- 22 Aslacus, *De natura caeli triplicis*, 4.
- 23 Howard Hotson, *Commonplace Learning: Ramism and Its German Ramifications, 1543–1630* (Oxford, 2007), 101–102.
- 24 See, on this technique, Brian P. Copenhaver and Charles B. Schmitt, *Renaissance Philosophy* (Oxford, 1992), 227–239; Hotson, *Commonplace Learning*, 46–48.
- 25 Aslacus, *De natura caeli triplicis*, 181–214. This third book was later excerpted and republished in English translation, as Ralph Jennings (tr.), *The Description of Heaven. Or, A Divine and Comfortable Discourse of the Nature of the Eternall HEAVEN, the Habitation of God, and all the Elect* (London, 1623).
- 26 Aslacus, *De natura caeli triplicis*, 205–214.
- 27 Caroline Bynum Walker, *The Resurrection of the Body in Western Christianity, 200–1336* (New York, 1995).
- 28 Ibid., 280–291.
- 29 Trevor O’Reggio, ‘A Re-Examination of Luther’s View on the State of the Dead’, *Journal of the Adventist Theological Society* 22 (2011), 154–170.
- 30 Martin Lohse, *Martin Luther: An Introduction to his Life and Work* (Edinburgh, 1987), 73–74; David C. Steinmetz, *Calvin in Context* (Oxford, 1995), 172–186.
- 31 Shackelford, ‘Unification and the Chemistry of the Reformation’, 307–309. In Shackelford’s view, this part of the work is at least *compatible* with Aslaksson’s Paracelsian cosmology, and possibly causally related to it. He separately discusses the relationship between orthodox Lutheran views of the resurrected body and Paracelsian doctrine in ‘Paracelsianism and the Orthodox Lutheran Rejection of Vital Philosophy in Early Seventeenth-Century Denmark’, 246–248.
- 32 Aslacus, *De natura caeli triplicis*, 196–198; especially 198: ‘UBI autem & QUOMODO in hoc supremo Caelo sit corpus Dominicum: curiosissimum & supervacaneum (ut monet Augustinus) est inquirere. Tantummodo in Caelo esse credendum est. *Non enim fragilitatis est nostrae, Caelorum secreta discutere, sed est nostrae fidei, de Dominici corporis dignitate, sublimia & honesta sapere*’.
- 33 Dane T. Daniel, ‘Paracelsus on Baptism and the Acquiring of the Eternal Body’, in Gerhild Scholz Williams and Charles D. Gunnoe (eds.), *Paracelsian Moments: Science, Medicine, and Astrology in Early Modern Europe* (Kirkville, MO, 2002), 116–134; Dane T. Daniel, ‘Invisible Wombs: Rethinking Paracelsus’s Concept of Body and Matter’, *Ambix* 53 (2006), 129–142. Interest in the ‘resurrected body’ was an established part of the alchemical tradition before Paracelsus, too; see Zachary Matus, ‘Resurrected Bodies and Roger Bacon’s Elixir’, *Ambix* 60 (2013), 323–340. I am grateful to Jennifer Rampling for referring me to this article.
- 34 As noted by Shackelford, ‘Unification and the Chemistry of the Reformation’, 302, n. 21, there is evidence that Aslaksson reported having seen Paracelsus’s biblical commentaries in Tycho’s possession.
- 35 Aslacus, *De natura caeli triplicis*, 16–23.
- 36 J. L. E. Dreyer (ed.), *Tychonis Brahe Dani Opera Omnia* (Copenhagen, 1913–1929), 15 vols. (henceforth *TBOO*), vol. 6, 135 (Tycho to Christoph Rothmann, 13 August 1588).
- 37 Aslacus, *De natura caeli triplicis*, 40–180. On external intelligences and celestial motions, see Edward Grant, *Planets, Stars, and Orbs: The Medieval Cosmos 1200–1687* (Cambridge, 1994), 526–568.

- 38 Cf. *TBOO*, vol. 6, 178 (Tycho to Rothmann, 24 November 1589) and 221 (*Auctor ad lectorem*).
- 39 Sachiko Kusukawa, 'Vinculum Concordiae: Lutheran Method by Philip Melanchthon', in Daniel A. Di Liscia, Eckhard Kessler and Charlotte Methuen (eds.), *Method and Order in Renaissance Philosophy of Nature: The Aristotle Commentary Tradition* (Aldershot, 1997), 337–354, esp. 344–345; Sachiko Kusukawa, 'Nature's Regularity in some Protestant Natural Philosophy Textbooks, 1530–1630', in Lorraine Daston and Michael Stolleis (eds.), *Natural Law and Laws of Nature in Early Modern Europe* (Aldershot, 2008), 105–121, esp. 112–113.
- 40 Oskar Garstein, *Cort Aslaksson: Studier over Dansk-Norsk Universitets- og Lærdoms historie omkring år 1600* (Oslo, 1953), 193, 350.
- 41 Aslacus, *De natura caeli triplicis*, 166–173.
- 42 Aslacus, *De natura caeli triplicis*, 168: 'Alii vero quibus haec Copernici de mobilitate Terrae hypothesis minus aridet, ut quae unum de rapidissima Caeli subtilissimi revolutione declinans absurdum, in aliud aequae difficile impingere videatur. . . '.
- 43 In making this argument, on p. 169 of *De natura caeli triplicis*, Aslaksson draws on, and refers, to the spherics of the Calvinist theologian and mathematician, Abraham Scultetus: see *Sphaericorum libri tres . . . Accessit de solutione triangulorum tractatus . . . Pitisci* (Heidelberg, 1595), 98–105. As recorded on the end flyleaf of the extant copy in the library of the ETH Zürich, Tycho Brahe received this work via Aslaksson in February 1596.
- 44 Aslacus, *De natura caeli triplicis*, 41–44.
- 45 Adam Mosley, *Bearing the Heavens: Tycho Brahe and the Astronomical Community of the Late Sixteenth Century* (Cambridge, 2007), 74–75, 84–89, 94.
- 46 Aslacus, *De natura caeli triplicis*, 40, 122, 160.
- 47 Ibid., 66–72.
- 48 Aslaksson quotes Pena on 18–20 and 67. On Tycho's indirect knowledge of Pena, see Mosley, *Bearing the Heavens*, 76–77. It should be noted, however, that Scultetus's *Sphaericorum libri tres* also cites Pena; I have not undertaken to exclude the possibility that Aslaksson's knowledge of Pena's work was mediated by this source.
- 49 Aslacus, *De natura caeli triplicis*, 42–43.
- 50 Ibid., 44–45.
- 51 Mosley, *Bearing the Heavens*, 119–126.
- 52 Aslacus, *De natura caeli triplicis*, 183–184.
- 53 Aslacus, *Physica et ethica Mosaica, ut antiquissima, ita vere Christiana, duobus libris comprehensa* (Hannover, 1613).
- 54 Ann M. Blair, 'Mosaic Physics and the Search for a Pious Natural Philosophy in the Late Renaissance', *Isis* 91 (2000), 32–58, on 53.
- 55 See Kenneth J. Howell, *God's Two Books: Copernican Cosmology and Biblical Interpretation in Early Modern Science* (Notre Dame, IN, 2002), 73–108.
- 56 *TBOO*, vol. 7, 185–187 (Peucer to Tycho, 10 May 1589), 231–237 (Tycho to Peucer, 1590). On the problem of the supercelestial waters and their role in discussions of the fluidity of the heavens, see Grant, *Planets, Stars, and Orbs*, 332–335; W. G. L. Randles, *The Unmaking of the Medieval Christian Cosmos, 1500–1760* (Aldershot, 1999), *passim*.
- 57 *TBOO*, vol. 7, 232.
- 58 *TBOO*, vol. 7, 233; Aslacus, *De natura caeli triplicis*, 31.
- 59 *TBOO*, vol. 7, 233–235; Aslacus, *De natura caeli triplicis*, e.g. 7, 15, 22, 24–25, 36, 71, 73, 80, 87, 124–127, 132.
- 60 Aslacus, *De natura caeli triplicis*, 137. On p. 149, he cites Peucer's letter to Tycho of 10 May 1589, to which the 1590 letter is (in part) a reply.
- 61 Mosley, *Bearing the Heavens*, 99–102.
- 62 On 122–123, Aslacus quotes from what he describes as a certain letter of Tycho to John Craig, 'as Goclenius reports'. The quoted text comes, in fact, from Tycho's 'apologetic writing' to John Craig, as discussed below; see *TBOO*, vol. 4, 474. Since Goclenius is not a known correspondent of Tycho, however, this quotation illustrates how manuscript material originating on Uraniborg could have reached Aslacus via an indirect route.

- 63 TBOO, vol. 7, 228–229.
- 64 TBOO, vol. 7, 229.
- 65 TBOO, vol. 7, 239.
- 66 See TBOO, vol. 7, 195 (Tycho to John Craig, 25 October 1589), and 222 (Tycho to Thaddaeus Hagecius, 25 January 1590), where Tycho refers to having sent Hagecius a copy of his *Apologia* ‘around the beginning of November’. On Tycho’s quarrel with Craig, see Adam Mosley, ‘Tycho Brahe and John Craig: The Dynamic of a Dispute’, in John Robert Christianson et al. (eds.), *Tycho Brahe and Prague: Crossroads of European Science* (Frankfurt am Main, 2002), 70–83.
- 67 Of this letter in particular, Dreyer noted, TBOO, vol. 7, 411, that the extant copy he consulted and reproduced was ‘pluribus manibus scriptum et multis locis correctum vel auctum est’ – which is suggestive, at least, of a collaborative and prolonged process of composition.
- 68 Kolb, ‘Dynamics of Party Conflict in the Saxon Late Reformation’.
- 69 Christianson, *On Tycho’s Island*, 313–317.
- 70 Ibid., 316.
- 71 N. M. Swerdlow, ‘The Lunar Theories of Tycho Brahe and Christian Longomontanus in the *Progyrnasmata* and *Astronomia Danica*’, *Annals of Science* 66 (2009), 5–58.
- 72 Christianson, *On Tycho’s Island*, 318.
- 73 TBOO, vol. 7, 132–133 (Tycho to Peucer, 13 September 1588).
- 74 Mosley, *Bearing the Heavens*, 123–124.
- 75 See Olaf Pedersen, ‘The *Corpus Astronomicum* and the Traditions of Medieval Latin Astronomy’, *Studia Copernicana* 13 (1975), 57–96.
- 76 The two parts and the appendix of Longomontanus’s *Astronomia Danica* are independently paginated; I shall designate them as I, II, and Appendix. See, in this case, I, 5–41. There is an internal inconsistency in the organisation of the text: on the first page of the text, the *prognorismata* are listed as belonging to book one of the two books on spherics. However, the discussion of them is followed, on p. 51, with a *praefatiuncula* on the books of the spherics, and p. 52 begins the first chapter of what is clearly labelled the first book.
- 77 Longomontanus, *Astronomia Danica*, I, 118: ‘extra hanc cognitionem, nullus in Astronomia nosta artifex evadit’.
- 78 Ibid., I, 52.
- 79 Ibid., 118.
- 80 Longomontanus, *Disputatio Philosophica quae Secunda Astronomiae est, de Sphaerae Coelestis legitima constitutione officio, & multiplici utilitate* (Copenhagen, 1612); compare the diagram on sig. Av of this disputation with that on I, 55, of the *Astronomia Danica*. On university disputations as forms of professorial publication in this period, see William Clark, *Academic Charisma and the Origins of the German Research University* (Chicago and London, 2006), 203–208.
- 81 Longomontanus, *Disputatio Philosophica quae Secunda Astronomiae est*, sig. B3v: ‘I. An Philosophiae pars nobilissima sit Astronomiae, Metaphysica excepta? Affirm’.
- 82 For a different view, see Almási, ‘Rethinking Sixteenth-Century “Lutheran Astronomy”’, 10–13.
- 83 Kusukawa, ‘Nature’s Regularity in some Protestant Natural Philosophy Textbooks, 1530–1630’, 114.
- 84 Longomontanus, *Disputatio Philosophica quae Secunda Astronomiae est*, sig. B3v: ‘Ab ordinis ac motuum divine planè harmonia, cui multa Metaphysica vestigia impressa sunt, adeo ut Coelum non solum Naturae librum, sed & totius Universitatis expansum dicas’.
- 85 For Tycho’s changing attitude to astrological techniques, see Gábor Almási, ‘Tycho Brahe and the Separation of Astronomy from Astrology: The Making of a New Scientific Discourse’, *Science in Context* 20 (2013), 3–30; cf., however, Håkon Håkansson, ‘Tycho the Prophet: History, Astrology and the Apocalypse in Early Modern Science’, in Kevin Killeen and Peter J. Forshaw (eds.), *The Word and the World: Biblical Exegesis and Early Modern Science* (Basingstoke, 2007), 135–156. Robert S. Westman has noted the importance of

- genre constraints on the mixing of astronomy and astrology in *The Copernican Question: Prognostication, Skepticism, Celestial Order* (Los Angeles and Berkeley, 2011), 104–105.
- 86 Longomontanus, *Astronomia Danica*, I, 57–60, and Appendix, 38–43.
- 87 Ibid., II, 19: ‘nisi mordicus sacram scripturam paucis in locis, & non (ut videntur) nisi captui humano apparenter accomodatus’. See also Longomontanus, *Disputatio Philosophica quae Secunda Astronomiae est*, sig. A3r.
- 88 Longomontanus, *Astronomia Danica*, II, 17.
- 89 Ibid., 17–19. For Tycho’s use of this argument, see Mosley, *Bearing the Heavens*, 144–145.
- 90 As noted by Howell, *God’s Two Books*, 92, Tycho seemed not to.
- 91 Longomontanus, *Astronomia Danica*, I, 42–49.
- 92 Ibid., 42–43.
- 93 Ibid., 43–49. See also Moesgaard, ‘Cosmology in the Wake of Tycho Brahe’s Astronomy’, 296–298.
- 94 Longomontanus, *Astronomia Danica*, I, 45–46.
- 95 Howell, *God’s Two Books*, 103.
- 96 Longomontanus, *Astronomia Danica*, I, 43: ‘tenuissimum & subtilissimum, quippe incorporeo & insensibili similimum’; I, 45: ‘si quis spirituales respectu, & Aristotelis quintae essentiae assimilandum dixerit, haud multum, meo iudicio, a vero abluet’.
- 97 Longomontanus, *Astronomia Danica*, Appendix, 5–21. On the scholastic tradition, see Adam Mosley, ‘The History and Historiography of Early Modern Comets’, in Miguel A. Granada, Adam Mosley, and Nicholas Jardine (eds.), *Christoph Rothmann’s Discourse on the Comet of 1585: An Edition and Translation with Accompanying Essays* (Leiden, 2014), 282–325, esp. 291–297. For cometary interpretation in a different near-contemporary Lutheran and Scandinavian context, but displaying similar themes and concerns, see Martin Kjellgren, *Taming the Prophets: Astrology, Orthodoxy and the Word of God in Early Modern Sweden* (Lund, 2011), 129–183.
- 98 Longomontanus, *Astronomia Danica*, Appendix, 17–21. See also Mosley, ‘The History and Historiography of Early Modern Comets’, 297–311, 323–325.
- 99 Longomontanus, *Astronomia Danica*, Appendix, 17–21. For Melanchthon’s understanding of God’s use of celestial secondary causes, see Sachiko Kusakawa, ‘Aspectio Divinorum Operum: Melanchthon and Astrology for Lutheran Medics’, in Andrew Cunningham and Ole Peter Grell (eds.), *Medicine and the Reformation* (London, 1993), 33–56.
- 100 Longomontanus, *Astronomia Danica*, Appendix, 5: ‘[Hagecius] admirandis Dei operibus, quomodo id eveniat pie adscribit, & a nostra plenaria cognitione remotum adscribit, quod & ego [Tycho] non inficio’. For the source of Longomontanus’s quotation, see *TBOO*, vol. 3, 27.
- 101 *TBOO*, vol. 3, 306–307.
- 102 Longomontanus, *Astronomia Danica*, Appendix, 9–11.
- 103 Ibid., Appendix 7–11.
- 104 Shackelford, ‘Unification and the Chemistry of the Reformation’, 301–302. See also, however, Hiro Hirai, ‘*Logoi Spermatikoi* and the Concept of Seeds in the Mineralogy and Cosmogony of Paracelsus’, *Revue d’histoire des sciences* 61 (2008), 245–264, for the pre-Paracelsian roots of seminal theory.
- 105 Longomontanus’s quotation of Tycho, as indicated in n. 100, was part of an *apologia* for expressing opinions on a topic that had eluded other great men; we must either accept the implication that Tycho’s views were not fully worked out, or suppose that Longomontanus was dissimulating in order to maximise the credit that he could claim for himself.

6 The Book of Nature and the Word of God

Lutheran natural philosophy and medicine in early-seventeenth-century Denmark and Norway

Morten Fink-Jensen

In the sixteenth century, Melanchthonian natural philosophy was established at the University of Copenhagen with the implication that the study of nature was about God. Natural philosophy (or physics) and medical ideas were therefore useful or even necessary in the education of the Lutheran pastor and in the edification of the population. Towards the end of the century, Lutheran orthodoxy became dominant in Denmark and Norway, and with it came an attack on human reason and its (lack of) ability to deal with subjects that pertained to faith. The question is to what extent orthodoxy and the critique of reason in the early seventeenth century had an impact on natural philosophy and medical ideas. In the attempt to contribute to an answer, this chapter will focus on how the relationship between natural theology, medicine and theology were presented in scholarly debates, in textbooks and in devotional literature of the Era. Special attention will be paid to the Danish physician and scholar Caspar Bartholin the Elder, who in 1613 became professor of medicine at the University of Copenhagen where he continued in the tradition of the Melanchthonian study of nature. In 1624, Bartholin obtained a chair in theology, and it begs the question if Bartholin as a theologian continued to support Melanchthonian natural philosophy or if his new profession forced him to reconsider his view.

Melanchthonian natural philosophy and the University of Copenhagen

After the Lutheran Reformation of the joint kingdom of Denmark and Norway in 1536, the reestablishment of the University of Copenhagen as a model Lutheran university was deemed crucial by King Christian III and his advisors. The University of Copenhagen was then the only university in the two countries, and it was assigned with the task of educating the clergy in the new faith, as well as creating the framework in a broader sense for the consolidation of the Reformation among the populace.¹ To facilitate this, a new university charter was issued in 1539. The Danish king had enlisted the help of the Wittenberg reformer Johann Bugenhagen, who stayed in Denmark for two years, to assist in

drawing up both the university charter and a new Church Ordinance, and the Wittenberg connection weighed heavy in both documents.

With regards to the organisation of the University of Copenhagen not only Bugenhagen, but also Philipp Melanchthon, Martin Luther's close associate in Wittenberg, wielded his direct influence. Melanchthon had reconstructed the educational system in the German Lutheran principalities, and in Copenhagen, too, the university became Melanchthonian – or Philippist – from the outset with teaching devised to play an active part in the consolidation of the Reformation. To achieve this, the university charter prescribed textbooks and lecture notes by Melanchthon to form the base of teaching in the faculties of Theology, Medicine and the Arts.² A characteristic trait of Melanchthonian educational reform was the desire to include natural philosophy and medicine in a Lutheran framework, making these branches of learning not just theoretically affiliated to theology, but also practically useful to the Lutheran student or pastor.³ It was Melanchthon's vision that natural philosophy, that is the study of nature, and medicine were disciplines created by God in order for man to employ them in the service to God and to be educated from them in divine providence. This vision was expressed in the Copenhagen university charter, which stated that 'the noble arts and disciplines are gifts from God, who gave man ingenuity and wished it to be refined'.⁴

For the remainder of the sixteenth century, the Melanchthonian view of nature prevailed at the University of Copenhagen, and natural philosophy and medicine continued to be deemed necessary in the training of the Danish and Norwegian clergy. Theology, however, was always formally viewed as being superior to natural philosophy. In that respect theology and natural philosophy did not merge into one discipline. But it was considered to be true that there could be no contrast or division between natural philosophy and theology. Nature was the living proof of the majesty of God, and by studying nature one would realise how God had created everything in the universe with a purpose. The Book of Nature, an immensely popular metaphor with scholars and clerics alike in early modern Europe, was a supplement or an introduction to the Holy Book containing the Word of God.⁵

Another important difference between the Book of Nature and the Word of God did persist. Whereas the study of the Word of God had to adhere strictly to a dogmatic Lutheran interpretation which was defined by the university theologians who had been authorised to speak on the behalf of the Church and its royal ruler, the reading of the Book of Nature was to a lesser extent bound by such considerations. Obviously, the end result was supposed to support the dogmatic interpretation of the Word, but the road the natural philosopher took in order to arrive at the desired religious destination mattered less. This does not mean that all philosophical or natural magical schools of thought could be freely applied at the university, but the study of nature was not fixed to any one dogmatic approach. Melanchthonian natural philosophy was closely tied to Aristotelian philosophy and Galenic medicine, but they were not the only sources of inspiration, and certainly not in any dogmatic form, neither to

Melanchthon himself nor to his many followers and students. Lutheran natural philosophy could therefore play host to a number of theories and ideas about nature and the best way to investigate it.

In sixteenth-century Denmark and Norway, besides the nonetheless dominant Aristotelian and Galenic traditions, major parts in the study of nature and in the world of medicine were notably played by Paracelsian ideas or the spagyric chemical medicine and philosophy as for example propounded by the Danish physician Peter Severinus in his *Idea medicinæ* in 1571.⁶ Also Neoplatonic and Hermeticist ideas were prevalent in intellectual circles; in particular at the research facility established in 1576 by Tycho Brahe in conjunction with his observatory on the Island of Ven.⁷ However, a distinctive mark of the study of nature was that these different theories and intellectual traditions were almost as a rule performed in combination with one another. It was in fact rare to come across a stalwart follower of, say, either Aristotle or Paracelsus in the sense that he would not acknowledge the contributions to the study of nature by other learned schools of thought and vehemently fight them all. Such one-track minded scholars mostly only existed in heated discussions and debates in the writings within the learned world. Indeed, Peter Severinus was taken for a follower of Paracelsus, but the full title of his work, *The Idea of Philosophical Medicine which Constitutes the Foundation for All Paracelsian, Hippocratic, and Galenic Doctrines*, shows that even though he certainly favoured Paracelsus over Galen, his aim was to establish a common foundation for the practice of medicine. This does not necessarily make Severinus a Philippist, but he can be called an exponent of Melanchthonian natural philosophy in as much as his philosophical medicine ultimately was about God and the God-created universe. He can also be said to have shared with Melanchthon an eclectic ideal of natural philosophy which was a trademark of the learned scholar, the *polyhistor*, regardless of confessional belonging. Similarly, Tycho Brahe felt free to lend his support to any philosophical theory which was congruent with his own observations and calculations, and at the same time he felt free to criticise and discard any theory that was not, but he also believed that the ultimate goal of discovering the system of the world required an agreement between astronomy, physics and theology.⁸ Again, Tycho's outlook is that of natural philosophical eclecticism. Not that every branch of learning was necessarily equally important or relevant in this pursuit, but the underlying notion of the inability of a singular discipline to explain the appearance of the universe, and the call for agreement with theology, fits with the Melanchthonian way of reading the Book of Nature.

The advent of orthodoxy

When the predominantly Philippist Lutheranism of the sixteenth century in Denmark and Norway gradually gave way to a more orthodox Lutheranism in the early seventeenth century, the ideal of the close tie between natural philosophy and theology was not immediately challenged or changed. On the contrary, as will be demonstrated below, the orthodox Lutherans generally gave

renewed support to the idea of the Book of Nature as a way of consolidating the true Lutheran faith, and they sought to strengthen the unity between natural philosophy and theology.

However, orthodox Lutheranism became increasingly aware that true faith could not be obtained by way of nature. To this end only the Word of God would suffice. This view was nothing new in as much as it was inherent in Melanchthonian natural philosophy from the beginning. But the orthodox Lutheranism resulted in a renewed emphasis on the fact that natural philosophy could not on its own terms express any divine truths in the way that the Bible could. This distinction was due to the need felt by the orthodox theologians to constantly define what constituted true Lutheranism as opposed to other Protestant confessions and Churches, resulting in a process of confessionalisation which in Denmark–Norway reached its climax in the years prior to the Thirty Years' War. In this process justification by faith – and faith alone – was stressed over and over, and this meant that human reason and man's ability to obtain insight into what was immediately observable was subordinated even further to faith and theology.

As a result, even though an agreement or a unity between natural philosophy and theology was the aspiration, the early seventeenth century in general witnessed an increasingly strong distinction between theology as the study of all things divine and natural philosophy as a discipline which could and should apply itself in the support of theology, but was not in its own right a path to knowledge of the divine truths. This incipient separation from theology would eventually lead to the advance of natural science.⁹ In Denmark–Norway, it was a sign of things to come when in 1636 a royal decree stipulated that a master's degree in philosophy (the Arts) no longer was sufficient to obtain a benefice. This was precisely 'because philosophy and theology are two different branches of learning'.¹⁰ Henceforth any candidate to be considered for a position as pastor were to have passed the theological exam (*teologisk attestats*), which in 1629 had been introduced at the University of Copenhagen. Until that point, philosophy (including natural philosophy) was considered to be so closely attached to theology that a graduate of philosophy was formally qualified to become a pastor.

The impending schism between theology and natural philosophy was, however, only in the making, and hardly discernible in the 1620s and 1630s. Melanchthonian natural philosophy, and the eclectic Lutheran approach of the sixteenth century which was comparable to the natural philosophy of Melanchthon, thus prevailed. Lutheran orthodoxy has generally been critically viewed by historians for being legalistic and intolerant, and the early seventeenth century has been characterised as a time when 'the orthodox state church tightened its grip on the populace'.¹¹ It could certainly be argued that the process of confessionalisation in Denmark–Norway brought about a Lutheran orthodoxy which in many ways resembled its staunch gnesio-Lutheran counterpart in Germany. But in matters of investigation into nature in support of religion, orthodoxy could seemingly take a comprehensive, almost tolerant, approach.

This approach stands out clearly in the works of Caspar Bartholin the Elder. Born in the Danish town of Malmö in 1585, he in 1603 began studies in theology and the Arts at the University of Copenhagen. The following year, he embarked on a lengthy grand tour of Europe while studying at a number of universities in the process, including a total of three years in Wittenberg where he took his master's degree in 1605. From there, his peregrinations took him through Germany to Leiden and Louvain, he travelled in England and France, and after having made his mind up to concentrate his studies on medicine, he had a prolonged stay at the university in Padua focusing on the study of anatomy. After further travels and studies in Italy, he received his doctorate in medicine in Basle under the auspices of Caspar Bauhin in 1610. By then Bartholin had been offered the prospect of becoming professor in Copenhagen, and he returned home by making a detour which first took him to Vienna, Bratislava and again to Wittenberg where he in 1611 published his anatomical textbook, *Anatomicæ institutiones corporis humani*. That work made his name in the world of medicine, and Bartholin's son, the anatomist Thomas Bartholin, on several occasions expanded and revised it later in the century, taking the total number of editions of this book across Europe to around thirty.¹²

As author of numerous other university and grammar school textbooks on philosophy, natural philosophy and medicine, Bartholin proved quite popular across Northern Europe from around 1611, when he was appointed professor in Copenhagen (from 1613 professor of medicine), to his death in 1629. Besides perhaps the *Anatomicæ institutiones* the majority of his works have been largely forgotten today, but during his own lifetime, and in the first years following his death, numerous of his textbooks were printed not only in Copenhagen (then the only city with printing presses in Denmark-Norway), but also in a number of mainly German-speaking places such as Wittenberg, Rostock, Goslar, Greifswald, Frankfurt am Main and Strasbourg. Most of Bartholin's works were also printed several times, for instance the *Astrologia sive stellarum natura* in seven editions, 1606–1626, the *Physicæ generalis præcepta* in at least six editions, 1618–1630.¹³

The extent of Bartholin's eclectic approach is clear throughout his works. One example from *On the Study of Medicine*, printed in 1628, will suffice: in a paragraph concerning astronomy, Bartholin advised the students to read Johannes Kepler, Tycho Brahe and Christen Sørensen Longomontanus. The latter was a pupil of Tycho and professor of astronomy in Copenhagen. Interestingly, Bartholin did not appear to agree with any of them. As is evident from his *Systema physicum*, Bartholin supported the geocentric cosmology of Ptolemy because it in his opinion correlated best to the Bible and Aristotelean physics.¹⁴ However, he was probably inclined towards parts of Tychonian cosmology, and he for instance accepted Tycho's rejection of the impenetrable planetary spheres. But he rejected the Copernican system, which Kepler supported, and the semi-Tychonic comprise with Copernicanism which Longomontanus stood for could hardly have appealed to him either. Even so Bartholin effectively left it to the students to decide for themselves which theory they preferred. Such

an approach would have been unthinkable in matters of theology, but natural philosophy was different. Yet, it was the theological aspect of natural philosophy which explains Bartholin's decision. The common denominator between Tycho, Kepler and Longomontanus was that they as astronomers applied themselves to disclose the divine order of the universe in a Lutheran setting.¹⁵ In that context their differences regarding theories and methods could be deemed as being of minor importance.

Bartholin's approach to the study of nature suggests a broad outlook, and indeed he generally included and referred to an array of medical and natural philosophers in his works. And whether they were Lutheran or not seemed irrelevant to him. In *On the Study of Medicine*, Bartholin recommended a total of one hundred authors to be read by his students, but only twenty-nine of them can be classified as Lutherans.¹⁶ He revered Aristotle, cited Galen in ample measure, but also kept referring to Paracelsus and a host of Paracelsian and alchemical authors including Oswald Croll.¹⁷ He condoned Hermetic medicine and iatro-mathematics, and praised the natural magic of Giambattista della Porta, whom Bartholin had met in Naples in 1608.¹⁸ The recommendations were written and published at a time when Bartholin had become professor of theology (see further below), and this makes a strong case for the argument that pious natural philosophy were granted a great deal of autonomy during the early Age of Orthodoxy in the seventeenth century. Bartholin claimed that the pious physician had a better chance of curing his patient than that of an ungodly physician. Only the pious doctor could act as a tool in the hands of God and thus carry out his profession and God's will at the same time.¹⁹ But it was not enough to be god-fearing. A ballast of medical theory and practice was necessary too. And to make that ballast as stable and solid as possible, it was required that practically all available theories and philosophical ideas weighed in.

Uncovering the secrets of nature

What further facilitated the eclectic approach of Bartholin was another distinct feature of orthodoxy in Denmark-Norway. According to leading orthodox theologians, the Word of God should not only be heard and followed. It should also be experienced and perceived by the senses. Inherent in Lutheran orthodoxy was a call for penitence, and during the 1620s daily 'exercise of devoutness', consisting of intense and preferably tearful reading of religious texts, the saying of comprehensive prayers and singing of hymns, were absolutely necessary for any person who truly believed in God – and the best possible way to show the surrounding society that one belonged to an exemplary Christian household.²⁰

That had a bearing on natural philosophy because applying your senses in order to experience the meaning of the Word of God made it possible, to some extent, to use human reasoning to this end. This experience could also be of a mystical nature; a meditative path to the understanding of God's dwelling within the divine creation of man. This side to orthodoxy was not particularly inclined towards natural philosophy, but would rather, at least on the face of it,

stress the need for limiting the use of natural philosophy along the thoughts set forth by the fifteenth-century canon Thomas à Kempis in *The Imitation of Christ*. This immensely popular devotional book was printed for the first time in a Danish translation in 1599, with several reprints appearing of the translation the following thirty years, and it contained an abundance of statements about how the Word of God surpassed all knowledge of philosophers and ‘wise men’ of this world.²¹ Yet, even this trend within orthodox Lutheranism did not seek to undermine natural philosophy. This was definitely true of the translator and editor of the Danish version of à Kempis’s work, Jon Jacobsen Venusin, who was about to become professor of physics at the University of Copenhagen and was a close friend of Tycho Brahe. Rather, it was a question of getting your priorities right. Perhaps the incentive behind Venusin’s edition was indeed to demonstrate that he was aware of the need to prioritise. But if one heeded Thomas à Kempis’s words and always remembered that no other knowledge rivalled let alone equaled the Word of God, then the road was in fact open for an interpretation of nature as a guidebook for the Christian searching for the inner truths of Creation – and thereby a deeper knowledge of the Creator.

Orthodox Lutheranism on the threshold of the seventeenth century thus asserted its support of the Melanchthonian view of the Book of Nature as a work where one could learn about divine providence, and that nature was thus complementary to the Bible. It is therefore no surprise that Melanchthonian textbooks continued to be used in the faculties of the Arts and Medicine in the first part of the seventeenth century at the University of Copenhagen.²² At the Faculty of Theology, however, the legacy of Melanchthon had gradually become marginalised because Philippism was seen as associated with crypto-Calvinism, which the Danish Church, especially under the leadership of Hans Poulsen Resen who in 1615 had become bishop of Zealand, took great pains to distance itself from. But Melanchthonian natural philosophy was by and large left intact. This was allowed for by the same theologians, who within the sphere of religion were busy with condemning human reason for being blind and corrupted by the original sinfulness of man. Resen, notably, lambasted ‘the old sluggish, vicious and ill-fated reason’, and he ridiculed those who let themselves be deceived by ‘Mrs. Reason’.²³ But at the same time he conceded that human reason contained a glimmering spark of the long-lost human qualities from before the Fall of Man, and that spark could be put to good use in the *artes liberales*.²⁴ The bottom line was that it mattered not if natural philosophy as such was applied in the search for divine truths or in the general understanding of Creation. What mattered was to what extent and by whom it was applied.

This paved the way for a continued promulgation of the metaphor about the Book of Nature in devotional literature and university theses alike in the early seventeenth century. The Danish pastor Jordan Hansen Pfreundt in 1601 likened the Garden of Eden with ‘the School of Nature’ where God had placed Adam and Eve with the intent of thereby teaching them His majestic wisdom.²⁵ Pfreundt believed that his readers were basically put on earth for much

the same reason. And at the University of Copenhagen professor of Greek (and soon to be professor of theology), the Norwegian Cort Aslaksen, in his *De mundo disputatio prima* of 1605, similarly argued that the natural world had been created by God as a school or training ground for the Christian.²⁶ The strongest and most influential literary utilisation of the Book of Nature in this period, however, undoubtedly came from the German theologian Johann Arndt, bishop in Celle from 1611 to his death in 1621. In his major works, *True Christianity* (*Vier Bücher vom wahren Christentum*, 1605–1609) and *Garden of Paradise* (*Paradiesgärtlein*, 1612) he called for more piety in the daily life of the Lutheran Christian, and he called for that piety to be the result of a more literal reading of the Bible. His teachings gained him a large following and created a pious movement which can be seen as a forerunner of the pietism movement later in the seventeenth century.²⁷

The influence of Arndt in Denmark–Norway in the early seventeenth century was significant with practically all leading theologians expressing their utmost reverence for ‘that pious Johann Arndt’s spiritual remedy’, as voiced by bishop Resen in 1619.²⁸ Perhaps the most important impact of Arndt was that on Holger Rosenkrantz the Learned, the Danish nobleman turned theologian, and whose personal spiritual breakthrough which led him to become ‘reform orthodox’ seems to have happened under the influence of Arndt.²⁹ During the first decades of the seventeenth century, Rosenkrantz became greatly admired by Danish and Norwegian theologians because of his erudition and biblical scholarship, earning him the byname the Learned. Besides being lord lieutenant, as a prominent nobleman Rosenkrantz was also a member of the council of the realm, which gave him significant political influence, and he can be likened with an unofficial minister of educational and church affairs until the late 1620s when he retired to his estate to pursue his own scripture-based theology. This theology bore important similarities to that of Arndt, but also argued that Biblical doctrine understood in its true meaning would form or shape man to a peculiar level of piety. As events unfolded, Rosenkrantz would end up being accused of false teaching by the Danish Church in the following decade, but that would have seemed inconceivable around 1620.

The first book by Arndt to be translated into Danish (and the first edition of a work by Arndt in the Nordic region) was the fourth book of *True Christianity*, the *Liber naturæ* or *Das grosse Weltbuch der Natur*, in 1618. This is a clear indication of how topical the Book of Nature had become in a wider popular religious context (because the discussion of Arndt’s theology in academic circles was not dependent on a Danish translation). The translator was Peder Nielsen Gelstrup, professor of Latin in Copenhagen, who owed this career to the academic support by bishop Resen and the pecuniary support by Christian Friis to Borreby, the recently deceased king’s chancellor who had shared Resen’s orthodox vision for the Danish Church. Gelstrup dedicated his publication to Kirsten Munk, the morganatic wife of King Christian IV, and Arndt’s book was thus as good as sanctioned by the ecclesiastical and political elite in the kingdom.³⁰

Arndt's work was an instruction for the Lutheran believer on how to perceive nature as a key to the understanding of God's will and plan for mankind. This was a traditional way of applying the metaphor of the Book of Nature in devotional literature. But Arndt also presented to the reader a deeper and more detailed understanding of the natural world which included a call for the investigation of nature and its secrets. Arndt had studied medicine before deciding on an ecclesiastical career, and he was well versed in natural philosophy and in particular in Paracelsian medical philosophy.³¹ This background is evident in large parts of the *Liber naturæ*.

Of the many things laid down by God in the Book of Nature, Arndt highlighted that it could be read as an herbal, and that nature contained God's pharmacy. Anyone, learned and unlearned, had access to this herbal and pharmacy, but to extract useful information from it required knowledge of the alphabet of nature, namely the doctrine of signatures. This doctrine was propounded by Paracelsus and taught, on the basis of the micro- and macrocosm analogy between man and universe, that the shape and colour of a plant or its parts could be used to determine the curative qualities of that particular plant.³² If its leaves resembled the shape of eyes or ears, they could be used to cure eye or ear illnesses. If the leaves were the colour red, they were under the influence of the red and violent planet Mars, which was held to rule the gall bladder in the human body. The colour would thus be the signature or the headline of the leaf which would reveal to what curative purpose it could be applied. But the question remained as to exactly how the powers of the red leaf or any other part of the natural world could be utilised. Furthermore, no one had yet read the entire Book of Nature, and Arndt estimated that not even a thousandth of the healing powers of the world's herbs had been discovered.³³ There was still much work to be done, and almost as a rule the powers or the *essence* of nature had to be extracted by those skilled to do so by means of the art of distillation or alchemy:

Once you know not only the exterior form and *signature*, but the inner hidden form, and you reveal this by the true art of distillation, that is you extract the potency in which the real healing power lies, the pure and plain *essence* and clear light from the small shells and minute hiding places where Our Lord has laid down these inner forms, then you shall taste the goodness of the Maker in His work, and praise Him with all your heart.³⁴

Physicians, natural philosophers and in particular alchemists were all as useful as they were necessary to carry out this work of uncovering the divine secrets hidden in nature. After all, it was what God wanted them to do. The divine secrets were not meant to stay secret. It was part of God's plan that man should discover them. In that way the natural philosophers or physicians not only acted according to the will of God, in fact they were under the direct influence of divine powers which emanated from the stars and which made these insightful men instruments in the hands of God.³⁵ No secret in nature was uncovered unless Gods wanted it to be so, and even a discovery or the expert knowledge of the

individual physician or chemist was bestowed on him by God, just like a tree did not yield a fruit by its own will, but the fruit would grow in due course.³⁶ Obviously, the fruit of knowledge that were to befall the natural philosopher or physician was not awarded at random, but only to those who were pious believers in the Almighty as well as diligent pursuers of the secrets of nature.

To Arndt and the brand of Lutheran orthodoxy he stood for, it seems there could be nothing wrong with investigations into nature. On the contrary, God demanded them. But he upheld the well-known limit to the insight to be gained by reason, which could never penetrate Heaven itself and obtain knowledge about matters restricted to faith. This went a long way to defuse some of the tension between theology and natural philosophy, and even if not all orthodox theologians sceptical of human reason were ready to follow Arndt all the way, the voice of Arndt certainly lent authority to the continuation of the eclectic and Melanchthonian approach to natural philosophy of the sixteenth century where almost any number of philosophical ideas about nature, and in the case of Arndt mainly Paracelsian theories, could be enlisted to carry out God's will. This also becomes evident from a closer look at the theological works of Caspar Bartholin.

Caspar Bartholin: a physician becomes theologian

In 1624, Cort Aslaksen, who in 1607 had become one of the three professors of theology at the University of Copenhagen, died. It was the first time since Resen had been appointed bishop of Zealand in 1615 that a vacancy occurred in the Faculty of Theology. The bishop of Zealand, considered to be the highest ranking bishop in Denmark-Norway, held the chair of *theologus tertius*. Aslaksen had been *theologus primus*, and his chair was obtained by the second professor, Jesper Brochmand. The honour of succeeding Brochmand as *theologus secundus* befell Caspar Bartholin, and that immediately made him one of the most influential theologians in the kingdom and put him in line to one day perhaps obtain the title of bishop for himself, either of Zealand or one of the other dioceses.

The Faculty of Theology was responsible for the education of pastors in Denmark-Norway, it could act as a law court in certain ecclesiastical matters, and it was frequently engaged by the king as a special tribunal or judicial council in cases where, in actual fact, the opinion of God was deemed necessary. The Faculty was thus charged with the responsibility of defining and upholding the true Lutheran faith in the realm. As a consequence, a decision on who to be appointed professor could not be taken lightly. Seen in this context, the fact that a natural philosopher and doctor of medicine, a person without formal training in theology, was chosen to succeed Aslaksen appears significant. As was customary, the appointment was by royal decree, but very likely it was a result of the influence of Holger Rosenkrantz on university matters. When Bartholin in 1611 wrote his anatomical textbook, *Anatomicæ institutiones corporis humani*, he dedicated it to Holger Rosenkrantz, and he would henceforth be Bartholin's

patron while at the same time exerting a heavy influence on Bartholin's religious outlook. The influence of Rosenkrantz on the Faculty of Theology was already significant with Jesper Brochmand, who would eventually succeed Resen as bishop of Zealand in 1639, being another disciple of Rosenkrantz.

As a student, Bartholin had shown a keen interest in theology, and after he had been appointed professor of medicine in 1613, he had on special occasions and in his writings displayed his extensive theological expertise.³⁷ Most notably in 1618 bishop Resen, who in that year was also Vice-Chancellor of the university, asked Bartholin to deliver an address on 18 February at the anniversary of Martin Luther's death. The address, which was printed the following year, heaped praise on the Wittenberg reformer while at the same time refuting a wide range of theologians who held views which conflicted with those of Luther. These theologians not only included familiar names in the orthodox Lutheran lineage of false teachers such as Robert Bellarmine, Theodore Beza, Johann Eck and Johannes Oecolampadius, but also proponents of *religio paracelsica* such as Adam von Bodenstein.³⁸ According to a private letter from the physician Ole Worm, Bartholin's university colleague, the speech was met with enthusiastic approval.³⁹ The reception may have fuelled Bartholin's zest for theology, and it is evident from the correspondence the following year between Bartholin and Rosenkrantz that they discussed the possibility of Bartholin becoming professor of theology, with Bartholin being so eager that he urged Rosenkrantz to put the matter before the king's chancellor.⁴⁰ It would appear that was exactly what Rosenkrantz did in 1624 to secure Bartholin's nomination.

When Bartholin in 1624 succeeded Aslaksen as professor, he was thirty-nine years old, but his health appears to have been in decline. In 1622 and 1624, he travelled to the spas of Karlovy Vary in Bohemia to receive treatment, and he was even too ill to be present at the ceremony when he in 1626 was conferred doctor of theology. In 1629, he died without fully having put his mark on Danish theology compared to his two colleagues in the faculty, Resen and Brochmand. Furthermore, he devoted a considerable amount of time to continue to write on medical and natural philosophical subjects, including the student's handbook *De studio medico*, written in 1626, and the 1,300 pages *Systema physicum*, both published in 1628. However, as would have been expected of him, Bartholin also published on matters of theology including a number of theses, sermons, edifying books as well as a student's handbook, *De studio theologico*, from 1628. These works do not compare with the scope of his works on medicine and natural philosophy, but they are none the less sufficient to determine Bartholin's theological stance and thereby in part the official theology of the Faculty. But most importantly in this context, they show whether his stance could be expected to have implications for the view on natural philosophy and the reading of the Book of Nature.

Nature in the theological works of Bartholin

Bearing in mind how Bartholin in his works on medicine and natural philosophy sought to include virtually as many different theories about the study of

nature as possible, it is striking how much the same approach was applied by him in his works on theology. This of course only pertained to those theologians who were orthodox Lutherans, or Fathers who could be claimed to be in agreement with Lutheranism. It is no surprise that Bartholin's theological eclecticism stopped short of embracing theologians who were branded as heretics by Lutheran orthodoxy. Even so, Bartholin goes out of his way to display unity within Lutheranism.

In one of his published university theses, *De biblicorum partitionibus* from 1628, Bartholin gave prominence to five most erudite theologians whom he considered to be in full agreement on their view of the classification of the biblical texts. The five theologians were Augustine, Martin Luther, Philipp Melancthon, Martin Chemnitz, and Niels Hemmingsen. This is a good example of how a high-ranking Danish theologian of the post-Reformation era attempted to present orthodox Lutheranism as essentially being devoid of internal strife. Augustine, the church father, was included by Bartholin in order to show that the original Wittenberg reformers, Luther and Melancthon, were in agreement with the early Church. The position of the reformers were then seen to have been carried on by first the German bishop Chemnitz, who in 1580 was instrumental in the publication of the *Book of Concord*, which was formally outlawed by the Danish king for being too gnesio-Lutheran or 'right-wing', and second the Danish Philippist theologian Hemmingsen, who in 1579 had been suspended from his post at the University of Copenhagen on grounds of 'left-wing' crypto-Calvinist leanings. These two were no doubt singled out by Bartholin in order to show that despite being regarded by most as each other's opposite, the orthodox and the Philippist theologians could indeed find common ground in what Bartholin presented as the true heritage of the Lutheran Reformation.⁴¹ This desire for staying on the middle of the Lutheran road, or at least giving the impression of it while orthodoxy was being promoted with more or less subtlety, was prevalent in the Danish Church of the early seventeenth century.⁴² It was very much the above-mentioned theology of Rosenkrantz which Bartholin and his contemporaries hoped would accommodate this common ground and thereby overcome the visible divisions within Lutheranism.

In his student's guide to the study of theology Bartholin begins, in the spirit of Rosenkrantz, by admonishing the student that the daily practice of prayer and piety (*preces et pietas*) formed the basis of a successful study.⁴³ The student would not comprehend true theology unless he at the same time practiced it. Besides this prerequisite, a number of ancillary linguistic and philosophical subjects (*linguarum et artium studia*) were necessary to master. The latter included natural philosophy or 'worldly wisdom' (*sæculari sapientia*), which Bartholin stressed the student of theology should not neglect. Mathematics, physics and astronomy should be pursued because it would often be from knowledge of the natural world that divine mysteries could be correctly understood or interpreted. Bartholin warned, however, that worldly wisdom should not be used in vain attempts to explain the nature or qualities of God. Natural philosophy was inferior to theology itself because only theology addressed the Word of God and the question of man's salvation. In that respect, too much or too deep

occupation with natural philosophy was a waste of time, and Bartholin dramatically exclaimed that if God was to give him the chance to relive his years spent on the study of natural philosophy and medicine, he would instead devote them to the study of scripture.⁴⁴ These words quite possibly mirrored Bartholin's true feelings, but there was no doubt an element of rhetoric to be found in them as well. After all, the purpose of the student's handbook was to spur the prospective theologians to devote themselves fully to their main study.

In another book from 1628, *Benedictio Aharonis*, a printed sermon in Danish on the Benediction (Numbers 6:23–27), Bartholin dwelt further on the ability of man to gain insight into nature.⁴⁵ The book included a large section where Bartholin attempted to explain how the blessing was bestowed on man by means of the Word of God. This caused him also to deal with the question of how to understand and interpret the Word of God as the proximate cause of nature. Contrary to man and his idle speech, Bartholin explained that

God is a spirit, has no mouth, nor tongue. Instead God's mouth or tongue may be called thus: He spoke, and it was done. This is a speech different to ours. When the sun rises or sets, God speaks. When the corn grows, when humans are born, God speaks.⁴⁶

The Word of God was simply His will, and it manifested itself in any physical movement or creation in nature. Whether it was the rotation of planets, the growth of plants or the generation of human beings, the Word of God was the real cause. This had a bearing on medicine and natural philosophy. Since the course of nature was maintained and preserved by God's will, and since the will of God could not be fathomed by the human mind, but should instead be obeyed as part of one's faith in God, it followed that there was a limit to the legitimacy and purpose of worldly wisdom. In fact, Bartholin skewered the fallacies of his very own medical profession:

This is how it is with all medicine and healing power: How is it that some remedies can be used by man against poison, as well as against this or that disease; some can induce perspiration, some can purge; some can strengthen the head and not the stomach, some the liver, lungs, kidneys, spleen, limbs, eyes etc.? When you ask the worldly wise to explain it, their answer is that it is either because of *qualitates occultæ*, which means that they do not understand it, and that is their honest answer, or, to make it appear that they have an answer, they say it is because of the nature and *forma specifica* of the remedies, which is just as well if they had kept quiet. For it is the same question as to why this or that herb can have such and such peculiar powers. To which the right answer comes from the Word of God; it is because God has said so or blessed it in this way.⁴⁷

Attempts by Bartholin's colleagues in the medical profession to explain the different qualities of medicaments and drugs, and why they had different effects

on different parts of the body and different diseases, were essentially in vain. Bartholin stressed he had biblical support to this claim, and he quoted Wisdom of Solomon 16:12: 'For it was neither herb, nor mollifying plaister, that restored them to health: but thy word, O Lord, which healeth all things'. The belief that the word of God and His blessing of nature empowered the natural bodies with certain healing properties also follows the opinion voiced by Arndt, namely that the experience of physicians and natural philosophers was limited to what God had wanted them to experience. And this in effect made the physician a tool in the hands of the Creator. Bartholin underlined that no one was healed or died from a disease without it being the will of God, and he pointed out that any skilled physician would have experienced how some patients were not cured by the same medicine which had cured others from the same disease, and how some patients were cured without any use of medicine at all.

However, realising that divine providence worked in mysterious ways should not lead to the fallacy of neglecting medical advice, Bartholin promptly warned, and that gave him a seemingly welcome opportunity to rehabilitate the medical profession somewhat. The powers of healing embedded in nature, which the physician utilised for curative purposes, were only available to him because of God's will and His blessing of nature.⁴⁸ Neglecting medicine, therefore, was to be likened with neglecting God's will and help, and to make matters worse, it could be seen as a temptation of God – as if one could count on God to step in and heal a disease whenever called for. Again, Bartholin quoted Biblical apocrypha to support his claim: 'Honour a physician with the honour due unto him for the uses which ye may have of him: for the Lord hath created him' (Ecclesiasticus 38:1). Yet it was important only to honour the physician for carrying out, or assisting in the fulfilment of, God's will. Crediting the physician and his remedy with being solely responsible for a cure was nothing short of idolatry.⁴⁹

It was therefore both commendable and necessary for the physicians or natural philosophers to carry out investigations into nature and study Creation. They were not, after all, born with intricate knowledge of the curative effects of all herbs, seeds and gems. The results of these investigations and studies they could apply in their profession; they should observe the effects of the components of their remedies, but they were to stop short of enquiring into the inner nature of the components and as to how or why the components possessed their visible effects. Such enquiries came too close to 'the secrets of the Kingdom of God which resists all human reason, knowledge, wisdom and arts'.⁵⁰ Reason was to be tamed, so to speak, in the service of God, but if this was achieved, reason could be put to good use, and, expanding on Romans 1: 18–23, Bartholin stated that 'in The Book of Nature or in the world of Creation God has left plenty to behold and contemplate about the invisible things and what can be known about God and his eternal power and deity'.⁵¹ It was, in fact, up to the 'worldly wise' to demonstrate just how closely the visible Creation mirrored the invisible things.

Notes

- 1 An overview of the Reformation in Denmark and Norway is given by Martin Schwarz Lausten, *A Church History of Denmark* (Aldershot, 2002), and O. P. Grell (ed.), *The Scandinavian Reformation. From Evangelical Movement to Institutionalisation of Reform* (Cambridge, 1995).
- 2 Morten Fink-Jensen, 'Medicine, Natural Philosophy, and the Influence of Melanchthon in Reformation Denmark and Norway', *Bulletin of the History of Medicine* 80 (2006), 439–464.
- 3 Sachiko Kusukawa, *The Transformation of Natural Philosophy: The Case of Philipp Melanchthon* (Cambridge, 1995).
- 4 'Artes et honestas disciplinas esse dona Dei, qui ingenia dedit hominibus et uoluit ea excoli'. Quoted from the Latin charter which is printed in William Norvin, *Københavns Universitet i Reformationens og Orthodoxiens Tidsalder*, 2 vols. (Copenhagen, 1937–1940), vol. 2, pp. 9–70 (quote p. 12).
- 5 An introduction to the history of the metaphor in conjunction with natural philosophy is provided by Peter Harrison, "'The Book of Nature" and Early Modern Science', in Klaas van Berkel and Arjo Anderjagt (eds.), *The Book of Nature in Early Modern and Modern History* (Leuven, 2006), 1–26.
- 6 *Idea medicinæ philosophicæ fundamenta continens totius doctrinæ Paracelsicæ, Hippocraticæ et Galenicæ* (Basle, 1571). On Severinus, see Jole R. Shackelford, *A Philosophical Path for Paracelsian Medicine. The Ideas, Intellectual Context, and Influence of Petrus Severinus: 1540–1602* (Copenhagen, 2004), and Ole Peter Grell, 'The Acceptable Face of Paracelsianism: The Legacy of "Idea Medicinæ" and the Introduction of Paracelsianism Into Early Modern Denmark' in O. P. Grell (ed.), *Paracelsus: The Man and His Reputation, His Ideas and Their Transformation* (Leiden, 1998), 245–267.
- 7 John R. Christianson, *On Tycho's Island. Tycho Brahe and His Assistants, 1570–1601* (Cambridge, 2000).
- 8 Kenneth J. Howell, 'The Role of Biblical Interpretation in the Cosmology of Tycho Brahe', *Studies in History and Philosophy of Science* 29A (1998), 515–537, 526.
- 9 Andrew Cunningham, 'Getting the Game Right. Some Plain Words on the Identity and Invention of Science', *Studies in History and Philosophy of Science* 19, no. 3 (1988), 365–389. See also Cunningham's contribution in this volume.
- 10 'effterdi Philosophia och Theologia ere thuende vnderscheedlige videnschaber'. in H. F. Rørdam (ed.), *Danske Kirkelove 1536–1683*, 3 vols., (Copenhagen, 1883–1889), vol. 3., pp. 256–257.
- 11 Lausten, *Church History of Denmark*, 128.
- 12 The works of Caspar Bartholin the Elder are extensively dealt with in Morten Fink-Jensen, *Fornuften under troens lydighed. Naturfilosofi, medicin og teologi i Danmark, 1536–1636* (Copenhagen, 2004), 231–359. An introduction in English is available from Ole Peter Grell, 'Caspar Bartholin and the Education of Pious Physician' in O. P. Grell and Andrew Cunningham (eds.), *Medicine and the Reformation* (London, 1993), 78–100. See also Grell's contribution in the present volume.
- 13 The bibliographical information stems from H. Ehrencron-Müller, *Forfatterlexicon omfattende Danmark, Norge og Island indtil 1814*, 12 vols. (Copenhagen, 1924–1935), vol. 1, 257–264.
- 14 K. P. Moesgaard, 'How Copernicanism took Root in Denmark and Norway', *Studia Copernicana* 5 (1972), 117–151.
- 15 The connection between Kepler's astronomy (and astrology) and his religious outlook are discussed by Jürgen Hübner, *Die Theologie Johannes Keplers zwischen Orthodoxie und Naturwissenschaft* (Tübingen, 1975), and Peter Barker and Bernard R. Goldstein, 'Theological Foundations of Kepler's Astronomy', *Osiris* 16 (2001), 88–113.
- 16 Fink-Jensen, *Fornuften under troens lydighed*, 297. All hundred authors are discussed Ibid., 285–359.

- 17 The chemical remedies of Croll, a German Calvinist physician, were taken from his *Basilica chymica* (1609) and they were frequently prescribed by Danish physicians and recommended in medicinal handbooks of the 17th century. See Morten Fink-Jensen, 'Paracelsus og Danmark. Medicin og teologi i 1500- og 1600-tallet', in Charlotte Appel et al. (eds.), *Mentalitet og historie* (2002), 95–118.
- 18 Fink-Jensen, *Fornuften under troens lydighed*, 349.
- 19 Caspar Bartholin, *De studio medico* (Copenhagen, 1628), 2 recto.
- 20 The most common Danish phrase for these exercises of devoutness was 'gudfrygtigheds øvelse', literally meaning 'to practice fear of God'. The phrase appears again and again throughout the 16th and 17th centuries in printed religious literature, letters, and legislation etc. A classic outline of the extent and the importance of these exercises in a Danish context is the 100-page long introduction by J. Oskar Andersen, 'Dansk Syn paa Fromhed og 'Gudfrygtigheds Øvelse' i ældre luthersk Tid', in E. A. Sibbern (ed.), *Thomas Kingos 'Aandelige Siungekoor'* (Copenhagen, 1931).
- 21 Thomas à Kempis, *De imitando Christo. Om Christi Effterfølgelse*, translated by Jon Jacobsen Venusin (Copenhagen, 1599).
- 22 Fink-Jensen, *Influence of Melanchthon*, 457–459.
- 23 'den gamle dorske, vanartige og vansælige Fornuft'; 'Fru Fornuft'. Quoted from Bjørn Kornerup, *Biskop Hans Poulsen Resen. Studier over Kirke- og Skolehistorie i det 16. og 17. Aarhundrede*, 2 vols. (Copenhagen, 1928–1968), vol. 1, p. 368.
- 24 Ibid.
- 25 Pfreundt's remarks are in his preface to his Danish translation of a work (*Christlicher und ehrliebender Frewchen und Jungfrauen Lustgertlein* (Magdeburg, 1586) by the Magdeburg pastor Johann Baumgarten (Pomarius), *Christelige oc Ærekierre Frøkkeners, Jomfruers oc Tucktige Møøers Lysthawe oc Urtegaard* (Copenhagen, 1601), fol. A 5 recto. The work by Pomarius is also mentioned in a treatise in Swedish by Bengt Arvidsson, *Naturlig teologi och naturteologi. Naturen som bild i dansk fromhetstradition omkring år 1600* (Lund, 1990), where further literary examples of the allegorical or metaphorical use of nature are given.
- 26 Oskar Garstein, *Cort Aslakssøn. Studier over dansk-norsk Universitets- og Lærdomshistorie omkring År 1600* (Oslo, 1953), 180.
- 27 Martin Brecht, 'Das Aufkommen der neuen Frömmigkeitsbewegung in Deutschland' in Martin Brecht (ed.), *Der Pietismus vom siebzehnten bis zum frühen achtzehnten Jahrhundert* (Göttingen, 1993), 113–203.
- 28 'Hin fromme Johan Arnds Aandelige Lægedom'. In Resen's preface to a new edition of Christian Thorkelsen Morsing, *En liden Bog om Pestilentz is Aarsage, Forvaring oc Lægedom derimod* (Copenhagen, 1619), fol. A 6 recto. Morsing's book was first printed in 1546.
- 29 Jens Glebe-Møller, *Doctrina secundum pietatem. Holger Rosenkrantz den Lærdes teologi* (Copenhagen, 1966), 10. On Rosenkrantz, see also Glebe-Møller's contribution in the present volume.
- 30 Johann Arndt, *Liber Naturæ, eller Naturspeyel: Hvorledis Verden, som Naturens store Bog, efter Christelig udleggelse, vidner om Gud, oc til Gud henviser os . . . fordandskit aff Petro Nic. Gelstrupio* (Copenhagen, 1618).
- 31 Brecht, 'Das Aufkommen der neuen Frömmigkeitsbewegung in Deutschland', 131–132. Arndt had studied in Basle under the guidance of Theodor Zwinger. See also Hans Schneider, 'Johann Arndts Studienzeit', *Jahrbuch der Gesellschaft für Niedersächsische Kirchengeschichte* 89 (1991), 133–175.
- 32 Walter Pagel, *Paracelsus. An Introduction to Philosophical Medicine in the Era of the Renaissance* (Basle, 1982), 149.
- 33 Arndt, *Naturens store Bog*, 66.
- 34 'Naar du kender, icke aleeniste den udvortis form oc *signatur*, men den inderlige skiulte form, oc du obenbarer denne formedelst den rette distillere kunst, at du uddrager den krafft, i huilcken den rette lægedom ligger, den pure rene *essentz* oc klare Lius, aff hine smaa skalehuss oc kleine skiul, hvor gud herren haffuer samme inderlige form indlagt:

- Da skalt du smage Skaberens godhed i hans gierning, oc aff hiertet prise hannem'. Ibid., 66–67.
- 35 Ibid., 140–141. Arndt explicitly referred to the 'astronomy' of Paracelsus as the source of this view.
- 36 Ibid., 143.
- 37 For instance, in 1617 Bartholin wrote against the Marburg physician Rudolph Goclenius the Younger's attempt to explain the resurrection of the dead. Bartholin, drawing on arguments provided by Holger Rosenkrantz, maintained that the doctrine of the resurrection of the dead was solely a matter of faith and could not – and should not – be explained by reason. Caspar Bartholin, *Illustrium quæstionum philosoph. et medic. miscell. prodromus de philosophia in medicina usu et necessitate exercitation* (Copenhagen, 1617), exercitatio V.
- 38 Caspar Bartholin, *De Luthero panegyricus* (Copenhagen, 1619), fol. B 4 recto.
- 39 H. D. Schepelern (ed.), *Breve fra og til Ole Worm*, 3 vols. (Copenhagen, 1965–1968), vol. 1, 31.
- 40 H. F. Rørdam (ed.), 'Breve til og fra Holger Rosenkrands', in *Kirkehistoriske Samlinger*, Series 3, vol. 6 (Copenhagen, 1887–1889), 40; Andersen, *Rosenkrantz*, 242.
- 41 Caspar Bartholin, *De S. S. bibliorum partionibus exercitatio. In Regia Hafniensi Academia pro disputatione ordinaria pie doctis . . . publice proposita, præside Casp. Bartholino, . . . Respondente Ferdinando P. Payngk* (Copenhagen, 1628), fol. A 3 recto-verso. In what could be seen as a twist in the tale of 'science vs. religion' in 17th century Denmark, the defendant of this theological thesis, Ferdinand Payngk, was the son of Peter Payngk, Paracelsian physician and royal chemist to King Christian IV. Peter Payngk wrote an (unpublished) biography of Paracelsus, see Sven Limbeck, 'Paracelsus in einer frühneuzeitlichen Historiensammlung. Die "Rhapsodia vitae Theophrasti Paracelsi" von Peter Payngk' in Joachim Telle (ed.), *Analecta Paracelsica. Studien zum Nachleben Theophrast von Hohenheims im deutscher Kulturgebiet der frühen Neuzeit* (Stuttgart, 1994), 1–58. Payngk's son, Ferdinand, became a village pastor in Jutland.
- 42 Thorkild Lyby and Ole Peter Grell, 'The Consolidation of Lutheranism in Denmark and Norway' in O. P. Grell (ed.), *Scandinavian Reformation*, 114–143.
- 43 Caspar Bartholin, *De studio theologico compendiaria et genuinia tamen ratione incoando et continuando* (Copenhagen, 1628), fol. A 5 recto.
- 44 Ibid., fol. B 3 verso.
- 45 Caspar Bartholin, *Benedictio Aharonis. Det er, om Velsignelsen* (Copenhagen, 1628).
- 46 'Thi Gud er en Aand, hafuer icke Mund eller Tunge: Derfor kaldis Guds Mund oc Tunge denne: Han sagde det, saa blef det giort. Det er en anden Tale, end vor er. Naar Solen staar op eller neder gaar, da taler Gud: naar Kornet voxer, naar Menniskene fødis, da taler Gud'. Ibid. fol. A 9 recto.
- 47 'I lige maade hafuer det sig met all Medicin oc Lægedom. Huor kommer det sig, at somt kand tiene Mennisken imod Forgift, som imod den eller den Siugdom; somme kand drifue Sued, somme purgere; somme styrcke Hofuedet oc icke Mafuen, somme Lefuer, Lunge, Nyrer, Milt, Ledemod, Øjen etc. Naar mand spør de Verdslige vise derom, da svarer de, enten at det er *qualitates occultæ*, det er, de forstaar det icke, oc da svarer de mest Sanden; eller paa det de kunde siunis at suare noget, da siger de, det er af deris Natur oc *forma specifica*, oc det er lige saa fuldt, som de tagde stille; thi det er det samme Spørmaal, huorfor den eller den Vrt kand hafue saadan eller saadan underlig Kraft: Men det rette suar aff Guds Ord er, Fordi Gud hafuer sagd det, eller saaledis velsignet'. Ibid. fol. A 11 recto.
- 48 Ibid., fol. B 1 verso.
- 49 Ibid., fol. B 2 recto.
- 50 'Guds Riges Hemmeligheder, som afverguer all Menniskelig Fornuft, Forstand, Visdom oc Konster'. Ibid., fol. B 4 recto.
- 51 'I Naturens Bog eller i de skabte ting haffuer Gud effterlat saa meget at see oc beskue, om de usiunlige ting, og det som mand kand vide om Gud, hans evige Mact oc Guddom'. Ibid., fol. C 3 recto.

7 Holger Rosenkrantz, ‘the Learned’ (1574–1642)

Jens Glebe-Møller

The nobleman Holger Rosenkrantz, who acquired the epithet ‘the Learned’, proved a hugely influential figure in early-seventeenth-century Denmark. His status was not only recognised within Denmark, but he had a considerable European reputation. When the Scottish minister John Dury, a prominent member of the circle around Samuel Hartlib and Amos Comenius, travelled across Europe in the 1630s seeking to unify Protestantism, he particularly wanted to seek out Holger Rosenkrantz, because he considered him to be the most learned and pious man in the whole of Germany.¹

Born in Eastern Jutland, Holger was the third child of Jørgen Rosenkrantz (1523–1596), a prominent member of the King’s Council, and his wife Dorthe Lange, both of whom belonged to the Jutland nobility. Holger, as was the custom among the nobility, was initially taught at home by a private tutor, until at fourteen he was enrolled in the Latin school in Århus where he finished his education in 1590. He was now ready to undertake the Grand Tour which had become fashionable for wealthy young noblemen. Holger accordingly spent the next five years abroad. However, his travels were interrupted by returns to his home country and in terms of travel, he did not get beyond the Holy Roman Empire. He was, however, to become one of the first Danish noblemen to receive a university education.

Holger Rosenkrantz matriculated in 1590 at the University of Rostock. Here he met his tutor, the theologian Daniel Cramer (1568–1637). Cramer, only six years older than Rosenkrantz, guided him through the topics of rhetoric, mathematics, natural philosophy and, not least, the philosophy of Aristotle. Holger defended theses on several occasions in Cramer’s private ‘college’, and once publicly defended a thesis on the concept of time and place, chaired by the professor in philosophy and logic at the University of Rostock, Matthias Flacius the Younger, who like Cramer was an Aristotelian. Later Holger attended the history lectures of the professor of theology in Rostock, David Chytræus, which stopped when Chytræus fell ill. Holger corresponded regularly with his father describing what he was taught and expressing his excitement about Aristotelian philosophy and gnesio-Lutheranism. This caused some parental concern, not least because of Jørgen Rosenkrantz’s firm adherence to the Melanchthonian Lutheranism which had characterised post-Reformation

Denmark. In May, 1592 Holger Rosenkrantz returned to Denmark together with his tutor. It proved a brief stay, and half a year later, he commenced his studies at the University of Wittenberg still accompanied by Daniel Cramer.²

The theological faculty in Wittenberg was even more gnesio-Lutheran than the faculty in Rostock. Led by professor Samuel Huber (1547–1624) who took up his chair in 1593, many lectures and publications were directed against Calvinists and Philippist – pupils of Melanchthon or his Danish student Niels Hemmingsen,³ as well as anyone else whose theology did not correspond to the Formula of Concord of 1578. In terms of natural philosophy Aristotelianism dominated in Wittenberg, while supporters of the philosophy of the French Calvinist, Peter Ramus, the so-called Ramists, were held in contempt. Rosenkrantz, being an Aristotelian and a gnesio-Lutheran, would have felt at home in this environment. This is demonstrated by the thesis he defended on 12 January 1593 at seven in the morning with his tutor Daniel Cramer, who had recently acquired his MA in Wittenberg, as ‘præses’ [defender/teacher] to a packed auditory. The thesis titled *De præcipuis logicæ Aristotelicæ partibus, quas orator quidam Parisiensis scholis suis insectatus est* [About the Central Parts of the Aristotelian Logic which a Certain Orator has Condemned in His Own Parisian Lectures], must have proved popular since it was printed twice in Wittenberg that year. According to contemporary custom the ‘præses’, in this case Holger’s tutor Daniel Cramer, was the real author of the thesis,⁴ but the dedication to the three Copenhagen professors, Anders Christensen Riber, Anders Krag and Thomas Finke, plus the introduction, were written by Holger Rosenkrantz himself. Here he mentions that he had attended a party given by the Bishop of Sealand, Peder Winstrup, in the company of the above-mentioned professors, where he had defended Aristotle against Ramus. Presumably the party must have taken place after his return from Rostock and before he left for Wittenberg, most likely during the summer of 1592, and it would appear that the young Holger Rosenkrantz, evidently full of himself, had held forth at some length on this occasion.

We should not be surprised that Anders Christensen Riber (1551–1606), an Aristotelian and professor of medicine, is among the dedicatees. The following year, Riber took the opportunity to reciprocate by dedicating a thesis on Aristotle to Holger Rosenkrantz. Thomas Fincke, who died in 1656 at the mature age of ninety-five, was then professor of mathematics, but a decade later was promoted to professor of medicine, might well have been included among the dedicatees because of his praise of Tycho Brahe, a distant relation of Holger Rosenkrantz, in the introduction to his famous textbook on geometry,⁵ despite the fact that Fincke’s work drew on the philosophy of Peter Ramus rather than that of Aristotle. But the most surprising name among the dedicatees is that of Anders Krag (1553–1600), who was professor of mathematics and later of natural philosophy, and perhaps the most prominent promoter of the ideas of Peter Ramus in Denmark, producing several publications defending the Frenchman against Aristotelian attacks.

Peter Ramus, who was among the Calvinists murdered during the St. Bartholomew Massacre in France in 1572, published a number of works in which

he took issue with the then dominant Aristotelian logic. He is supposed to have defended the thesis '*Quaecumque ab Aristotele dicta essent, commentitia esse*' [*Everything Aristotle Has Said Is a Lie*]. Bearing in mind the problematic authorship of most students' theses in this period, this is not particularly creditable, but Ramus constructed his own logic, consisting of the central concepts of '*inventio*' (invention), '*judicium*' (judgement), and '*methodus*' (method).⁶ The writings of Ramus achieved considerable popularity in the first half of the seventeenth century, not only among Puritan or Calvinist theologians in England and North America, but also in Denmark. Works inspired by Peter Ramus are easily recognisable from their consistent use of dichotomies: beginning with an overall concept or topic, everything is then split continuously in two until its smallest unit is established.

A good example of such an unswerving use of dichotomy is the work by the professor of theology at the University of Copenhagen, Cort Aslaksen (1564–1624), *Physica et ethica mosaica, ut antiquissima, ita vere christiana duobus libris comprehensa* [*Natural Philosophy and Ethics in the Books of Moses which Are Both the Oldest and Truest Christian (Statements) Summed Up in Two Books*] published in Hannover in 1613. It contained a table which begins with living beings, some of which are classified as irrational, others as rational, and for the latter concludes with the soul, meaning the intelligence and will of God's image. As a follower of Petrus Ramus Aslaksen would have been seen as a crypto-Calvinist by gnesio-Lutherans. This is implied by a contemporary saying among Lutheran academics, '*ramismus est gradus ad calvinismum*' [Ramism is a step towards Calvinism]. Cort Aslaksen evidently promoted a Ramist natural philosophy beyond 1616 and was influenced by Calvinist and Philippist ideas until late in his career when he found it politique to express himself along more orthodox Lutheran lines. Aslaksen had, of course, been Tycho Brahe's assistant on the Island of Hven in the early 1590s and it is likely that Holger Rosenkrantz would have met him and been impressed by him during a visit to the island. Many years later, in 1620, when he met Aslaksen, Holger took the opportunity to praise a recent work on church history which Aslaksen had published in connection with the centenary of the Reformation in 1617.⁷ Evidently Rosenkrantz was familiar and on friendly terms with a number of professors within the University of Copenhagen who can be described as both Ramist in terms of natural philosophy and crypto-Calvinist in terms of theology from the 1590s.

Holger Rosenkrantz spent three years studying at the University of Wittenberg, finally returning to Denmark during 1595. Only towards the end of his stay in Wittenberg did he lay aside his interests in theology and natural philosophy to focus on the law, the subject he was there to study to be prepared for the future prominent role within the King's Council that he was destined to fill on his return. By then, his father, Jørgen, was not only old, but seriously ill, and wanted his son to return. Rosenkrantz's return to Denmark coincided with the appointment of his tutor, Daniel Cramer, as professor and dean to the cathedral in Stettin. Here Cramer remained until his death, publishing a considerable number of books. Apart from his history of the church in Pomerania, his most

well-known work is his book on sacred emblems, *Emblemata Sacra*, which was published in two parts in 1617 and 1624 and proved highly successful. The emblems, most often roses depicted in different forms and situations, illustrated a quote from the Bible in Luther's translation. The quote is placed above the emblem and an interpretation is provided below.⁸ The popularity of such books can be seen from the fact that some of the emblems were copied on to wall paintings in Danish village churches in the early seventeenth century.⁹ Even if Daniel Cramer's book on emblems contributed to the period's pious, devotional literature, he himself remained a gnesio-Lutheran who constantly clashed with his less orthodox colleagues in Stettin. Cramer also fell out with his former pupil, Holger Rosenkrantz, whom he had personally supervised for five years. In a letter from July 1622, he accused Holger of getting involved in issues which were the prerogative of theologians not laymen, and wanting to change what he termed 'the prevailing teaching', that is taking issue with accepted orthodox, Lutheran dogma.¹⁰ Holger Rosenkrantz responded at length in a letter the following year. Here he defended the priesthood of all believers: 'I don't take anything else upon myself than the calling every Christian has when transferred to the Kingdom of God' as he put it. Later he recapitulated how twenty-four years earlier he had struggled with doubts and scruples because of the then-obsession with theological disputes, until he had realised that Christian doctrine had to be based solely on Scripture, and referring to 1.Tim. 6,3ff., that this doctrine had to result in piety. It was exactly this doctrine, the main concepts of which are God's rule and God's Kingdom, which following the advice given in the Bible, he had worked on for twenty years. Accordingly, his doctrine was not erroneous, but that of the theologians at the University.¹¹ Evidently, this response did not find favour with his 'old' tutor, who, when wrongly informed later in the year that Holger Rosenkrantz had died, informed a mutual friend that: 'My Rosenkrantz has died . . . I am tempted to say that this is a considerable blessing for the church'.¹²

It is evident from his response to Cramer that Holger Rosenkrantz had experienced something of a religious crisis in the years around the turn of the century – this is often referred to in the scholarly literature as a conversion – causing him to have doubts about the validity of the orthodox Lutheran theology he had imbibed first in Rostock and then later in Wittenberg under Daniel Cramer's tutelage. Holger had discovered that this theology did not correspond with Scripture and the words of Jesus and that it would not result in a pious life. From this moment until his death in 1642, he spent most of his life trying to work out a '*doctrina secundum pietatem*', the label he later attached to it, in other words a doctrine or theology which leads to, and in itself is, an expression of piety.

First, however, he had to explain how the Bible could be correctly understood. He did so in a treatise finished in 1616. Its Latin-Greek title roughly translates: *An Admonition about Precaution against Self-Thought Exegesis Deduced from the First Letter to the Corinthians, Chapter 2*. In it Rosenkrantz argued that no Christian theology could be established without being based on the Bible.

In this Daniel Cramer agreed with him. However, founded on the Bible, a new theology could be established, a doctrine where the redeeming secrets of piety could only be achieved by living the Gospel of Jesus Christ daily.¹³ From then on Rosenkrantz constantly sought to develop his new biblical and salvation-historical theology which he intended to result in a work of no less than twenty-two volumes. In the process, he wrote no less than eighty-six theological treatises which, except from a couple of devotional books, remained unpublished. However, they appear to have achieved fairly wide circulation in manuscript copies not only in Denmark, but across Europe.¹⁴ Today they can be found in a number of research libraries: such as those in Copenhagen, Oslo, Stockholm, Tübingen, Wolfenbüttel. How copies of Rosenkrantz's manuscripts have ended up in these libraries is difficult to assess. However, given that we know that Holger Rosenkrantz was an active member of the republic of letters corresponding with theologians and scholars across Europe such as Jesper Brochmand and Caspar Bartholin in Copenhagen, Daniel Heinsius in Leiden, and Balthasar Meisner in Wittenberg to mention a few, we can safely assume that he often included a copy of one of his treatises with his letters for the information of his correspondents. These treatises eventually became part of the recipient's papers and manuscripts, which subsequently found their way into scholarly collections and then libraries.¹⁵ Rosenkrantz, like most of his learned contemporaries did not restrict his interests exclusively to academic matter, but was also fascinated by unusual or curious events, as can be seen from a small treatise he wrote in 1600, titled, *A True and Exhaustive Account of the Strange Apparition which God Has Displayed in Jutland*. Apparently, some peasants from a village on the Rosenholm Estate had been engaged in clearing a brook when they encountered a crowd of people dressed in differently coloured clothes who, armed with spears, were fighting each other. The local minister had heard a voice repeating thrice over: 'Woe, woe, woe'. Rosenkrantz interpreted the apparition and the voice as a warning from God to arouse us from our sins and the danger of complacency, signing the treatise with his initials HRK in the following manner: 'Herrens Rige Kommer' [The Lord's Kingdom comes].¹⁶

Theology remained Holger Rosenkrantz's preoccupation throughout his life, but he also found time to pursue his interests in the natural world, such as natural philosophy and astronomy. As early as the summer of 1592, having recently returned from Rostock, Holger took the opportunity to make a journey to the Island of Hven in the Sound, visiting Tycho Brahe's observatory. As already mentioned Tycho Brahe was a relation of Holger's and a close friendship developed between them. Holger also befriended others from Tycho Brahe's circle such as the first professor of history at the University of Copenhagen, Niels Krag (1530–1602), brother of the above-mentioned Anders Krag, an influential figure within the Court who was made Royal Historiographer in 1594, and Tycho Brahe's sister, the learned Sophie Brahe who assisted Tycho in his astronomical studies and observations. She later gave a description of Holger Rosenkrantz: 'Holger Rosenkrantz of Rosenholm, Councillor of the King's Council, who is a very pious, intelligent and learned man, whose equal cannot

be found today'.¹⁷ Later in 1598 when Tycho Brahe had been forced to leave the Island of Hven and had briefly settled in Wandsbeck in Northern Germany, Rosenkrantz visited him and assisted him in his observations of the eclipse of the moon. Tycho Brahe noted his persistence 'as is suitable for someone who loves heavenly as well as earthly wisdom' as he phrased it.¹⁸ Later that year when Holger Rosenkrantz married Tycho's niece, Sophie Brahe (1578–1646), who had been named after her aunt, Tycho sent Holger an epigram which played on Holger's love of wisdom (*sophia*), 'which has now been vanquished by his love for Sophie'.¹⁹ The two men remained friends and corresponded regularly until Tycho Brahe's death in Prague in 1601, presumably from lead poisoning. Only briefly during Tycho's short stay in Germany did the two quarrel, because Holger Rosenkrantz refused personally to hand King Christian IV copies of two of Brahe's works.²⁰ Rosenkrantz evidently considered it too risky to be seen as someone who openly sought to further the cause of someone who had recently fallen out of Royal favour.

The visit to Tycho Brahe in Wandsbeck may well have served to enhance Holger Rosenkrantz's interest in natural philosophy, Nature, medicine, and astronomy. He certainly acquired a fine collection of astronomical instruments on Rosenholm, and according to his friend and pupil, Caspar Bartholin, the elder (1585–1629), owned an excellent herbarium and was knowledgeable about medical remedies.²¹ Rosenkrantz also shared Tycho Brahe's interest in Paracelsianism. His wife Sophie Brahe regularly bought chemical preparations from Christian IV's Court chemist in Copenhagen, Peter Payngk, while he himself was 'very intimate' with the itinerant German Paracelsian physician, Nicolaus Teting.²² In this context, it is noteworthy that in 1622 Holger Rosenkrantz found himself accused of Rosicrucianism by none other than his former tutor Daniel Cramer, now professor of theology in Stettin. Cramer certainly confirmed Rosenkrantz's intellectual significance by pointing out that his influence was not limited to the kingdom of Denmark, but stretched deep into Germany. This was a cause for alarm because Rosenkrantz had become a mouthpiece for Spiritualists and Rosicrucians. This served to link Rosenkrantz's Paracelsian interests with dangerous religious radicalism and caused Holger Rosenkrantz considerable grief, not least because he found it difficult to disassociate himself from the accusations.²³ Rosenkrantz was certainly perceived by contemporaries as someone who was sympathetic to Paracelsianism. Thus, when the Paracelsian medical practitioner Hartvig Lohmann who had been active on the Island of Funen found himself accused of being a Rosicrucian and a dangerous heretic, he applied to the King in 1635 to have Holger Rosenkrantz 'the Learned' appointed investigating officer in the case against him.²⁴

Unfortunately, Holger Rosenkrantz appears to have made no efforts to integrate his natural philosophy into his new theology. Only in one instance in one of his later writings does he touch on the issue. Here Rosenkrantz states that 'natural philosophy can provide us with knowledge about God prior to the enlightenment of the Holy Spirit',²⁵ without elaborating further what that knowledge might consist of.

On his father's death in 1596, Holger inherited the family estate of Rosenholm to the north of the city of Aarhus. While he focussed on his studies, his wife Sophie Brahe took charge of the day to day business of running a large estate, as can be seen from her account-book.²⁶ She made sure all bills were paid, payments to the poor and towards the local parish church in Hornslet. She also ordered books for Holger from as far away as the United Provinces and paid the regular bills from book-sellers in Copenhagen and abroad. Holger managed to build a substantial library on Rosenholm which acquired European fame and was appreciated by their many foreign visitors. The library was temporarily lost during the Thirty Years' War, but it was later retrieved by Holger Rosenkrantz only to be destroyed by fire shortly after his death. In-between serving as administrator and accountant for the estate, Sophie gave birth to no less than thirteen children, many of whom died in infancy.

In 1616, Holger Rosenkrantz travelled in Germany for several months. First he went to Rostock then Giessen and Frankfurt. He met several of the period's leading theologians including Johann Arndt in Celle, who was superintendent in Lüneburg until his death in 1621. Arndt had through his prolific writings become the leading advocate of a pre-Pietist Lutheranism, the so-called reform-orthodox Lutherans who argued that Lutheran dogma had to find expression in piety. In his above-mentioned letter to Daniel Cramer from 1623, Rosenkrantz describes how Johann Arndt had paid him a visit in his hostel and that they conversed through the night about Christian subjects.²⁷ Johann Arndt's reputation depended primarily on his *Four* (later six) *Books on True Christianity* [*Vier Bücher vom wahren Christentum*], the first of which was published in 1606, which strongly emphasised the necessity of sanctification, which Rosenkrantz had read. But Arndt, who had drawn inspiration from Paracelsus, was also attracted to mysticism, and in the preface to his *Theologia Deutsch* published in 1597, he had attacked the obsession of his contemporaries with 'a polemical, verbose, conceited, quarrelsome theology'. Undoubtedly, Holger Rosenkrantz would have been familiar with this work too. The views expressed correspond with what Rosenkrantz later wrote about his own concerns and scruples and might well have influenced his so-called conversion around the turn of the century. However, Arndt and Rosenkrantz differed in their theology. Where Arndt emphasised that 'the knowledge of Christ consists predominantly in the practice and exercise of the Christian virtues and the fruits of the Holy Spirit than in science and theory', Rosenkrantz underlined that a renewal of Lutheranism could only be achieved through the formulation of a doctrine built on the foundation of the Bible. Mysticism, be it Paracelsian or otherwise, had no place in Rosenkrantz's theology.²⁸

While in Germany Holger Rosenkrantz succeeded his father as a member of the King's Council, thereby taking his place among the kingdom's aristocratic elite. However, he only took up the position when he finally returned from his travels in Germany in February 1617. As a result, he took part in a number of important diplomatic missions in the following years. Thus he was one of two members of the Council who travelled to the United Provinces in 1621

to sign the important treaty between Denmark and the Netherlands directed against Sweden, which was a constant concern of King and Council during this period.²⁹

Despite his many political and diplomatic engagements and the associated travel Holger Rosenkrantz still found time to spend on his studies at Rosenholm. He had, of course, by then established a sort of unofficial academy on Rosenholm, attracting mainly talented sons of the nobility, but also catering for talented youngsters from a less privileged background. Over the next thirty years, around seventy young noblemen and sons of burghers received part of their education at what a later period has labelled 'the school on Rosenholm'.³⁰

It is noteworthy that the academy on Rosenholm also accepted noble women, among them Birgitte Thott (1610–1662) who later wrote a treatise titled, '*Om et lykosaligt liv*', [*About a Blissful Life*], where she praised the learned Holger, 'who understood everything and had insight into all subjects and sciences'.³¹ Students under the guidance of Holger Rosenkrantz were taught languages, including Hebrew, which Holger himself mastered, natural philosophy, knowledge of nature and mathematics. The teaching was framed by daily devotion in the chapel of the castle. Many of the burgher sons who acted as tutors for the young noblemen and women later achieved significant positions within the church, the university or the Latin schools in Denmark-Norway. As the Englishman Sampson Johnson described it in a letter of 1633 to John Dury: '. . . all the great scholars of Denmark have had their first grounds of learning in his house'.³² Among those who attended the academy in Rosenholm were Niels Paaske who died as bishop of Bergen in 1636, Hans Wandal who died as bishop of Viborg in 1641, Knud Bieske who died 1612 having become professor of Greek at the University, Jakob Hasebard who became professor of mathematics in 1621, exchanging his professorship for rector at the Cathedral in Copenhagen the following year only to die three years later in 1625. Among those who thanked Rosenkrantz in their letters for the religious instructions he had given them while students, were Ole Hansen Slingerup, who died before he found employment during his *perigrinatio academica* in Padua in 1624.³³ The astronomer and mathematician Christen Longomontanus (1562–1647), who had been Tycho Brahe's assistant on the Island of Hven and later joined him in Prague, stayed at Rosenholm in 1601 where he is likely to have assisted with the teaching, before becoming professor at the University of Copenhagen in 1605.³⁴

Shortly after his appointment to the Royal Council Holger Rosenkrantz was appointed to three important educational committees of the Council. They were designed to provide a wholesale reform of higher education within Denmark-Norway. The first committee was concerned with the creation of so-called *gymnasier* in 1619, in many ways an extension to the already existing Latin schools. The *gymnasier* or advanced secondary schools were all situated in the 'old' cathedral cities, and Holger Rosenkrantz who had then been chosen as Royal administrator of the Island of Fynen, was appointed *director gymnasii* for the school in Odense and as such gave the inaugural speech in 1623. According

to historians of a later period, the school's staff consisted of a professor in theology, one in physics and mathematics, another in logic, while the school's headmaster taught Latin rhetoric and his assistant Hebrew and Greek. Ideally, they would be joined by a *medicus*, a physician, who during the summer would teach the students botany and in the winter anatomy.³⁵ This ambition was probably never fulfilled because university-educated physicians were thin on the ground in early-seventeenth-century Denmark. Apart from those who were attached to the Court and those who served as professors of medicine at the University, only a small number of physicians were available in the country, offering their services primarily to the nobility and wealthy burghers in the cities. That may well have been the reason why Holger Rosenkrantz in 1623 wrote to the famous Wittenberg physician and professor of medicine Daniel Sennert, and on behalf of the nobility of Funen offered him the post of physician on the island. Bearing in mind Holger Rosenkrantz's subsequent reputation as having been the main driver behind the establishment of the new *gymnasium* in Odense,³⁶ we can assume that the post offered to Sennert would also have included the tasks specified for the *gymnasium*.³⁷ The learned Holger's continued concern for the *gymnasium* can be seen from the fact that among his many charitable donations is one of 1,000 Imperial Thalers for one of the cleverest students at Odense Gymnasium.³⁸

The new *gymnasier*, of course, needed new educational material and textbooks. The Bishop in Odense, Hans Mikkelsen (1578–1651), Odense Gymnasium's headmaster, Knud Richardsen, and the assistant headmaster, Svend Petersen, who previously had taught at the academy on Rosenholm, wrote the philological textbooks, while Caspar Bartholin the older, Rosenkrantz's faithful pupil and friend wrote the textbooks in logic, rhetoric, natural philosophy, metaphysics and ethics. Most of them, however, were re-editions of earlier works and were typical of the period's Aristotelian textbooks.³⁹ But in the introduction to the book on rhetoric, which did not appear until 1622, Caspar Bartholin emphasises that he had been taught 'the new and true foundation for the tropes' by Rosenkrantz. The early-modern understanding of 'trope', as can be seen from Philip Melanchthon's *Institutiones rhetoricae*, published in 1523, was the use of a word with a different meaning than its literal sense. Holger Rosenkrantz, in his above-mentioned treatise from 1616 on the interpretation of Scripture, had already rejected this distinction between words in their literal sense and used figuratively, and replaced it with a distinction between what a word says (*dicere*) and what it teaches (*docere*). This is the distinction which Bartholin applied in the first seven–eight chapters of his book on rhetoric, often using direct quotations from Rosenkrantz's treatise.⁴⁰ This 'new' and 'genuine' distinction was, as I shall show, an important aspect in Rosenkrantz's efforts at creating a theology, or doctrine based on Scripture. Caspar Bartholin's textbook on rhetoric saw several editions, resulting in Rosenkrantz's interpretation of the tropes being taught to students in the *gymnasier* over a number of years. It was eventually succeeded by traditional textbooks on rhetoric, and Rosenkrantz's teaching about them was forgotten.

The second committee was concerned with a reform of the University of Copenhagen. Here Rosenkrantz was joined once more by some of those who had been involved in the above-mentioned school reforms, such as Bishop Hans Mikkelsen. The result of the committee's work was published in the so-called 'Novellae Constitutiones', which were signed and sealed by King Christian IV on 18 May 1621.⁴¹ These new regulations were primarily intended to tighten the demands placed on the students and the quality of the teaching of the professors. They stated that every student should master Latin and that no one could be employed as a minister or a schoolmaster unless they had studied at the university for at least two to three years. For those who had studied abroad, one year was sufficient as long as the university where they had matriculated at was not 'religiously suspect', in effect restricting students to foreign universities which corresponded in doctrine with Lutheran Denmark. Professors were ordered to teach both publicly and privately, 'as often during the week and the year as stipulated', and they were no longer allowed to dictate what they 'had pieced together from a number of authors'. The 'Novellae Constitutiones', however, do not say anything about the content of the teaching. Even so the content of what was to be taught in the different faculties at the University was discussed by the committee. Among the drafts for the new regulations a plan for the reform for the study of theology, written by Holger Rosenkrantz, has been preserved. The plan contains a draft of Rosenkrantz's theology. Thus it states that the study of theology should be based on the Bible and studied 'without polemics', echoing Holger's above-mentioned letter to Daniel Cramer written around the same time. The plan concludes with a detailed outline for the reading of the Bible over a period of three years.⁴² The plan was never introduced, but in 1622, Rosenkrantz donated a travel grant of 2,500 Imperial thalers for theology students at the University. According to the detailed letter of foundation, the recipient should be excellent in Latin, Greek, Hebrew, and 'the arts' (*artes liberales*). But more importantly, he should have been brought up 'especially in precisely the true, saving piety of the right teaching' [*in unice salutari ipsa veræ pietatis sincera doctrina*] 'according to God's own mouth and written Word without all human reason and wilful wisdom'.⁴³

It is noteworthy that Rosenkrantz's pupil and collaborator, Caspar Bartholin the Elder, professor of medicine at the University of Copenhagen, also served as a member of this committee and was responsible for the detailed draft for the reform of the study of medicine which, like the plans for theology, was never executed.⁴⁴

The third committee which Holger was on was also engaged in educational reform. In this case, it resulted in the establishment of Sorø Academy [*Academia Sorana*]. In 1586, fifty years after the Danish Reformation, King Frederik II had converted the Cistercian monastery in the Sealand town of Sorø to a school for thirty children of the nobility and thirty children of commoners, donating most of the land belonging to the monastery to the new school. By the early 1600s, plans were afoot to turn the school into an academy for the nobility, evidently inspired by similar undertakings across Europe. Accordingly, the school was

converted into an academy for the sons of the nobility, after extensive negotiations in the King's Council, the Kingdom's highest political and administrative executive. The foundation was established in 1623, and Holger Rosenkrantz appointed its first director [*Academiae nobelium Regiae Soranæ direktor*]. The teaching staff at the Academy was to consist of three professors in history, mathematics, and philosophy, plus a number of teachers in fencing, riding, and other disciplines considered necessary for young noblemen.⁴⁵ As director of the new Academy, Rosenkrantz utilised his many internal and external connections to recruit the best possible professors at the Academy. Far from all of his approaches to prominent European scholars proved successful, but some bore fruit. Among the more famous scholars who were recruited were the well-known historian, Johannes Meursius (1579–1639), whom Holger had met when visiting Leiden in 1622, and who became a regular correspondent of his, and the Rostock professor, Johannes Lauemberg (1590–1668), who was recruited as professor in mathematics, geography, and fortifications; somewhat later, in 1640, Henrik Ernst (1603–1665) was recruited as professor in law and moral philosophy, after having initially served as a tutor for a number of young noblemen and one of King Christian IV's sons at the Sorø Academy. Interestingly, Henrik Ernst had prior to his arrival at the Academy resided at Rosenholm where he might have taught. Sorø Academy – a name the school which eventually replaced it has retained – for a few decades had the status of a university. Today it has become a gymnasium with boarding for both girls and boys with no social restrictions on recruitment, but it still retains some of its heritage by being the only state school in Denmark.

While serving as a Royal Councillor, Holger Rosenkrantz still found time to work on his theological treatises, making drafts of his planned complete and final exposition of the true Christian doctrine. Meanwhile, in 1625, King Christian IV entered the Thirty Years' War, bringing disastrous consequences for the kingdom. Rosenkrantz appears to have been among those members of the Royal Council who were opposed to the intervention. Bearing in mind that the King did not appreciate Holger Rosenkrantz's theological views this undoubtedly served to marginalise Rosenkrantz further politically. Rosenkrantz noted at the time that in his opinion, the King had 'lost his way in his great wisdom'.⁴⁶

After Christian IV's defeat at Lutter am Barenberg in August 1626 while Wallenstein's troops were occupying Jutland, Rosenkrantz applied to the Royal Council to be released from his position as Councillor in order to find time to pursue his theological studies. He was backed by his friends within the nobility, but the request was refused. Rosenkrantz then approached the King with his request. Christian IV reacted angrily. He allowed Rosenkrantz to resign, but wrote a livid letter to the Royal Council where he stated that in effect Rosenkrantz had resigned before his request 'in a time when our religion, our person, and his fatherland has stood in the greatest danger'.⁴⁷ Rosenkrantz and his family left Funen while Wallenstein's lansquenets still ravaged and plundered Jutland, where he had initially resided outside Odense in the former monastery

at Dalum and finally at Odense Castle. The family moved to one of their estates in Scania, which then was still part of Denmark. A peace treaty was eventually agreed between the Holy German Empire and Denmark-Norway in Lübeck in 1629, and Rosenkrantz and his family were able to return to their beloved Rosenholm on 3rd October that year. A couple of years later, Holger described how that day was commemorated annually in the daily morning and evening devotions at the castle, in one of the few works he published in Danish, titled *Hør danske Mand* [*Listen Danish Man*].⁴⁸

From then on, life on Rosenholm continued uninterrupted. Sophie was in charge of the practical and economic matters, while Holger, now liberated from his political obligations as a member of the Royal Council, intensified his studies writing his treatises. Eighty-six of them have been either fully or partly preserved, added to which we have Holger's considerable correspondence where some of his letters, like the above-mentioned to Daniel Cramer, amount to theological treatises. Rosenkrantz's theology obviously drew on previous and contemporary theologians, such as the church father, Augustine, but it is in its totality his own. It is therefore worth recapitulating its main points:

Scripture tells us the story about God's rule (*regimen*). God has made his eternal covenant with humanity in order to lead fallen Man back to the eternal life in Christ. This covenant is revealed in the gospel 'in a universal sense' (*universe dictum*). But the gospel consists of two parts: God's law and God's gospel 'in a limited sense' (*speciatim sic dictum*). Through the law God offers us his 'chastising grace' (*gratia castigans*) and through the gospel in a limited sense his 'forgiving grace' (*gratia remittens*). From his promise to Adam (1. Book of Moses 3,15) to the present, this eternal covenant has existed, together with the revelation of it in the dual gospel. But God had also made a preliminary covenant with the Jews, and in this covenant had promised another, a 'physical' purpose: to make the Jews despair and force them to believe in Christ. Rosenkrantz in the best Lutheran tradition wanted to base his doctrine exclusively on Scripture. For him whenever Scripture speaks about the contrast between law and gospel, it is about the contrast between the law's preliminary 'physical' meaning, in contrast to its eternal meaning as a part of the gospel 'in the broadest sense'. The result is that the law as a judgemental and tyrannical power only affected the Jews. Christians on the other hand are subject to the chastising and educating grace of the law as a part of the gospel in a universal sense. Placed under the chastising grace of the law and the forgiving grace of the gospel, Christians are guided towards eternal life. The consequence is that Christians are not justified solely by faith in Christ's atonement of their sins through his death expressed in the well-known Lutheran doctrine of faith alone (*sola fide*). When Christians respond to the preaching of the law with active love God will declare us just. However, they will still remain sinners and will therefore always need justification through faith, but that is not the only justification and not the most important. The most important justification is received by those who live a pious life in accordance with the commandments of the New Testament.

Holger Rosenkrantz also developed his own teaching about the sacraments in a number of treatises, which surprisingly were enthusiastically received by the then-professor of theology and from 1638 Bishop of Sealand, Jesper Brochmand (1585–1652). Rosenkrantz rejected the gnesio-Lutheran doctrine about the Communion, which considered the ingestion of bread and wine as the consummation of the body and blood of Christ, which turns into a judgement for the non-believers, 'the undeserving' (*manducatio indignorum*). Instead he described Baptism and Communion as the 'ties' and 'touches' by which God contacts Christians and ties them to him.

It would appear that Rosenkrantz's fame grew even after he had retired to his study, continuously writing his unpublished treatises which he distributed to friends at home and abroad. The above-mentioned Calvinist minister John Dury (1596–1680) who worked constantly for a Protestant union between Lutherans and Calvinists from the 1620s and travelled widely in the process, wanted to visit him in 1634 on his way back from Sweden, describing him to his collaborators back in England: 'He Is reported to bee ye greatest man for Learning & Pietie of all Germanie, & in Denmark the man of greateist Authoritie & power with the Clergie yt euer was in it'.⁴⁹

Meanwhile, in 1631, the vicar Peder Wandal (1602–1680) published his book, *Oeconomia Dei: Det er Guds Aandelige Huszholdning*. Wandal was another of Holger Rosenkrantz's students who had stayed on Rosenholm in 1620. Like his old tutor, Wandal took an interest in the natural world and had created a cabinet of curiosity and an astronomical observatory in his vicarage in Southern Jutland. Peder Wandal reproduced Rosenkrantz's theology in his book. Rosenkrantz, rather than being pleased by the work of his pupil got furious and demanded that it be prohibited and all copies collected and locked up 'in the University's great chest'.⁵⁰ This event caused Rosenkrantz to seriously consider having his treatises published. To avoid the censors, which in Copenhagen were the professors of theology and in the provinces the individual bishops who had to give their permission for all books with theological content, Rosenkrantz contemplated having his works published in Germany. However, nothing came of it and none of Rosenkrantz's treatises were published in Germany.

Instead, five years later, in 1636, Holger Rosenkrantz published a book in German through a printer in Aarhus. Titled *Mirror of Princes* [*Fürstenspiegel*] it managed to evade episcopal censure. Once more the full title made play with the initials of Holger Rosenkrantz's name.⁵¹ The book consisted of a collection of pastoral writings and letters of the long-departed Margrave of Brandenburg and Duke of Prussia, Albrecht V, to which Holger had added an introduction. Here he expounded his doctrine about the double justification of faith and acts, as described above. It immediately proved controversial. First to attack it was the general-superintendent of the Royal part of Schleswig and Holstein, Stephan Klotz (1606–1668), who had just been appointed by King Christian IV. His condemnation was forwarded to the Faculty of Theology at the University of Copenhagen. Initially the Faculty took a fairly lenient approach in a statement to which Rosenkrantz responded. Stephan Klotz, however, continued

his attacks on Rosenkrantz's theology and as a result the Faculty of Theology shifted its position and joined in the condemnation, probably driven by its leading professor, Jesper Brochmand, and firmly assisted by the Court preacher, Peder Winstrup (1605–1679), a son of the above-mentioned bishop. First Holger Rosenkrantz responded to this wave of disapprovals and denunciations in a 1637 treatise titled: *The Truth about the Road to the Eternal Life* [*Veritas viæ vitæ æternæ*]. This was followed by a large *Apology in Latin* [*Apologia*] in two volumes, which Rosenkrantz dedicated to Christian IV. The volumes were finished in 1639, but were never published.⁵² The King passed the Apology to the Faculty of Theology to give their verdict. They informed Christian IV that Rosenkrantz's doctrine remained at variance with the teachings of the Lutheran Church. A number of responses from Rosenkrantz and pronouncements from the Faculty of Theology followed, but the outcome remained the same: Rosenkrantz's theology was not acceptable.

The copestone of the controversy proved to be three doctoral theses defended on the same day in November 1640 with Jesper Brochmand representing the Faculty of Theology as presiding teacher [*præses*], which indirectly condemned Holger Rosenkrantz's teaching about double justification. Brochmand engineered that by cleverly making the disputations respond to his recently published commentary to The Epistle of James in the New Testament. This is, of course, an epistle which has proved difficult to handle for generations of Lutheran theologians, because it unmistakably speaks of justification by acts. Luther tried to resolve the problem by labelling it as a 'straw-epistle', that is an epistle without any importance. Brochmand, however, explains the justification about which James wrote was solely a justification 'towards other humans'.⁵³ This was the ultimate confirmation that an irreparable rupture now existed between Rosenkrantz and the theologians, many of whom had been his friends and admirers. Now isolated, Rosenkrantz continued to work on his doctrine, '*Doctrina secundum pietatem*'. Of the planned twenty-two books, only a couple of the first plus a compilation have survived in copies. Rosenkrantz forwarded the first volume with a dedication to Christian IV on 1st of January 1640. The King immediately forwarded it to the professors at the Faculty of Theology, who unsurprisingly stated that it should not be published.

Rosenkrantz belonged to the upper echelon of the Danish aristocracy. This position was his by right and could not diminished by his disagreements with both King Christian IV and the kingdom's leading theologians. That was why in October 1642, he received an invitation from Crown Prince Frederik, later Frederik III, to a wedding in Nykøbing on the Island of Falster. He set out with his family to attend the wedding, but fell ill on the way and was forced to return to Copenhagen. Here he was attended by the Court physician Jacob Fabricius, but to no avail. He died on 28th October 1642 during the night in the presence of family and friends. The funeral took place on 19th of November in Copenhagen Cathedral where the funeral sermon was preached by the rector and dean, Oluf Vind (1590–1646). Oluf Vind published his funeral sermon the following year titled *The Lives and Deaths of the Saints*, which he dedicated in his

introduction to Holger's widow, Sophie Brahe. The book begins in accordance with early modern tradition with a portrayal of Holger's life and career. Rosenkrantz theological disagreements with the King and the leaders of the Danish Lutheran church are passed over in silence. Instead we are provided with detailed information about his last hours: we are told how Rosenkrantz tried to leave his death bed, but was helped back into bed by his relations. Rosenkrantz then responded by saying: 'That one might just as well die on a chair as in bed!' Finally, he exclaimed '*veni Jesu*' and expired. The funeral sermon was added to the carefully crafted biography. It was long, nearly a hundred printed pages in octavo, starting by paraphrasing the Book of Psalms, 72, v. 23–26. At the end of the book, no less than twenty-two Latin poems honouring Rosenkrantz are included. Most of the contributors were professors at the University of Copenhagen or Sorø Academy, such as the professor of medicine, Ole Worm, who had remained loyal to his former mentor.⁵⁴ Unsurprisingly none of the professors of theology contributed, to avoid the danger of being tainted with heresy by association. Only one prominent cleric, Peder Winstrup, the Bishop of Scania residing in Lund, produced a poem, printed first of the twenty-two.

After the funeral, the coffin was taken back to Holger's estate and placed in the family crypt in the church of Hornslet. Some years later, an epitaph for Holger and his wife was erected in the church. On top of the epitaph, a painting was placed showing Holger and his wife in prayer. A most fitting memorial for a man whose life had been shaped by his concern for piety.

Rosenkrantz may have suffered setbacks in his relations with King Christian IV and the country's leading theologians, but his reputation remained considerable at the time of his death. Thus the leading Wittenberg theologian Jacob Martini (1570–1649) gave a public address at a memorial service organised by the University of Wittenberg for Holger Rosenkrantz a year after his death (*Justa Holigero Rosenkrantz facta in acad. Witteberg d. 28. Oct., Wittenberg 1643*) – an event which appears to have been celebrated with great solemnity.⁵⁵

Undoubtedly Holger Rosenkrantz at the time of his death did not wield the influence he had done during the first couple of decades of the seventeenth century. He himself had renounced the political influence he had exercised as a member of the King's Council, but many of his former students and friends had deserted him in the wake of the confrontation with the Faculty of Theology at the University of Copenhagen and the King over his doctrine. He had been admired and befriended by many of the country's leading theologians and many of the Bishops had studied at his academy on Rosenholm. That it proved to be Jesper Brockmand who led the attack on him and his 'new' doctrine in the 1630s and 1640s must have been a disappointment, especially when it is borne in mind how close the two had been in the 1620s. Theologically Rosenkrantz's influence proved of short duration. The fact that his theological works remained unpublished due to the censors helps to explain that. He was also unfortunate to have tried to launch his theology which differed significantly from the official doctrine of the church at a time when the tolerance of theological differences was rapidly disappearing under the pressure

for religious uniformity. Furthermore, irrespective of the content of his theology, the fact that a layman like Rosenkrantz should express views on theology was not acceptable to the Lutheran clergy by the early seventeenth century – Luther’s call a century earlier for the priesthood of all believers had clearly had its day. Holger Rosenkrantz’s educational efforts, however, proved far more durable, such as the establishment of the *gymnasier* and Sorø Academy, even if the reforms of the university were not fully carried out. Likewise, a considerable number of talented students appear to have spent time at his so-called school on Rosenholm. His interest in natural philosophy, astronomy, nature, and medicine are in evidence in all these undertakings. Perhaps the note by the great intelligencer, Samuel Hartlib, about Holger Rosenkrantz’s undertakings in his *Ephemerides* provides an appropriate assessment by stating that Rosenkrantz was ‘framing by Education and learning a New Commonwealth being the father of every one in particular’.⁵⁶

Notes

- 1 G. H. Turnbull, *Hartlib, Dury and Comenius* (London, 1947), 159.
- 2 For Holger Rosenkrantz’s studies in Rostock and Wittenberg see J. Oskar Andersen, *Holger Rosenkrantz den Lærde. En biografisk Skildring med Bidrag til Belysning af danske Kirke-og-Skoleforhold I det syttende Aarhundredes første Halvdel* (Copenhagen, 1896), 15–82.
- 3 For Niels Hemmingsen and his international significance, see my ‘Socialtiske aspekter af Niels Hemmingsens forfatterskab’, *Kirkehistoriske Samlinger* (1979), 7ff.; and Martin Schwarz Lausten, *Niels Hemmingsen. Storhed og fald* (Copenhagen, 2013), passim.
- 4 See Andersen, *Rosenkrantz*, 46–47.
- 5 For Thomas Fincke, see *Dansk Biografisk Leksikon*, 3rd ed., Copenhagen, vol. 12, 398–399.
- 6 The best work on Ramus’s philosophy remains Walter J. Ong, *Ramus, Method, and the Decay of Dialogue. From the Art of Discourse to the Art of Reason* (Cambridge, MA, 1958).
- 7 See Andersen, *Rosenkrantz*, 237.
- 8 For emblematic work of Cramer, see Sabine Mödersheim, ‘*Domini Doctrina Coronat*’. *Die geistliche Emblematik Daniel Cramers (1568–1637)* (Frankfurt/New York, 1994); and Bernhard Scholz, ‘Religious Meditations on the Heart: Three Seventeenth Century Variants’, in E. Oestrem et al. (eds.), *The Arts and the Cultural Heritage of Martin Luther* (Copenhagen, 2003), 99ff.
- 9 Lisbet Juul Nicolaisen, ‘Emblemmalerier i danske kirker’, *Kirkehistoriske Samlinger* (1969), 126ff.
- 10 For this letter, see Andersen, *Rosenkrantz*, 260–261.
- 11 The letter is extensively discussed in Andersen, *Rosenkrantz*, 263ff.
- 12 Ibid., 270.
- 13 Ibid., 154ff.
- 14 See the list of his unpublished manuscripts in Jens Glebe-Møller, *Doctrina secundum pietatem. Holger Rosenkrantz den Lærdes teologi* (Copenhagen, 1966), 160–175.
- 15 Extracts from letters to and from Holger Rosenkrantz have been edited by H. F. Rørdam and published in *Kirkehistoriske Samlinger*, 3rd Series, vol. 3, 5, and 6 (Copenhagen, 1874–1886).
- 16 The treatise, which was not published by Rosenkrantz, has been published by H. F. Rørdam in *Kirkehistoriske Samlinger*, 3rd Series, vol. 5 (Copenhagen, 1884–1886), 659ff.
- 17 Peter Zeeberg, *Tycho Brahes Urania Titania. Et digt om Sophie Brahe* (Copenhagen, 1994), 50–51.
- 18 *Tychonis Brahe Dani Opera Omnia*, Tom. XIII (Copenhagen, 1926), 126.

- 19 Fr. Friis (ed.), *Epistolae quas per annos a 1596 ad 1601 Tycho Brahe et Oligerus Rosenkrantzius inter se dederunt* (Copenhagen, 1896), 28.
- 20 Andersen, *Rosenkrantz*, 90–91. For this see also the somewhat speculative view of their relationship in John R. Christianson, *On Tycho's Island. Tycho Brahe and His Assistants, 1570–1601* (Cambridge, 2000).
- 21 Andersen, *Rosenkrantz*, 113 and 127.
- 22 See O. P. Grell, 'The Acceptable Face of Paracelsianism; The Legacy of Idea Medicinæ and the Introduction of Paracelsianism Into Early Modern Denmark', in O. P. Grell (ed.), *The Man and His Reputation, His Ideas and Their Transformation* (Leiden, 1987), 261.
- 23 Andersen, *Rosenkrantz*, 254–271 and Grell, 'Acceptable Face', 264–265.
- 24 See M. Fink-Jensen, *Fornuften under troens lydighed. Naturfilosofi, medicine og teologi i Danmark 1536–1636* (Copenhagen, 2004), 229, note 70.
- 25 Glebe-Møller, *Doctrina*, 50.
- 26 H. Poulsen (ed.), *Sophie Brahes regnskabsbog* (Copenhagen, 1955) (covers the years 1607–1640).
- 27 Andersen, *Rosenkrantz*, 148.
- 28 For Rosenkrantz's contacts to Arndt and other reform-orthodox Lutherans, see J. Glebe-Møller, 'Holger Rosenkrantz, Arndt og Andreä', in *Kirkehistoriske Samlinger*, 7 Series, vol. 5 (Copenhagen, 1963–1965), 306ff.
- 29 For Holger Rosenkrantz's diplomatic and political engagement, see the article about him in *Dansk Biografisk Leksikon*, XII (Copenhagen, 1982), 345–346.
- 30 Andersen, *Rosenkrantz*, 114ff.
- 31 See M. Alenius et al. (eds.), *Latin og Nationalsprog i Norden after Reformationen* (Copenhagen, 1991), 153. It is interesting that Birgitte Thott also translated the Fürstenspiegel in 1636 at the same time as Rosenkrantz published his edition, however, neither her treatise nor translation was published.
- 32 Cited in Glebe-Møller, *Doctrina*, 11.
- 33 For the academy on Rosenholm and Holger Rosenkrantz influence over his 'students', see Andersen, *Rosenkrantz*, 113ff.
- 34 For Longomontanus, see *Dansk Biografisk Leksikon*, IX (Copenhagen, 1981), 109–110.
- 35 Rasmus Nyrup, *Historisk-statistisk Skildring af Tilstanden i Danmark og Norge i ældre og nyere Tider*, vol. 3, part 1 (Copenhagen, 1804), 104–105.
- 36 Jørgen Carsten Bloch, *Den fynske Geistligheds Historie*, vol. 1 (Odense, 1787), 93.
- 37 For the letter, see *Kirkehistoriske Samlinger*, 3rd Series, vol. 6, 71–72. The attempt to recruit a physician for Funen was matched by similar initiatives in other regions. Thus the nobility on the island of Lolland employed a physician during these years who resided in the town of Nakskov with a guaranteed salary of 200 Imperial Thalers, see D. H. Cold, *Lægevæsenet og Lægerne under Christian IV's Regiering* (Copenhagen, 1858), 82–83.
- 38 This is mentioned by Ole Vind in his funeral sermon for Holger Rosenkrantz, see J. F. Rørdam's extracts from funeral sermons, *Kirkehistoriske Samlinger*, 3rd Series., vol. 6, (Copenhagen, 1887–1889), 29.
- 39 Kristian Jensen, *Latinskolens dannelse. Latinundervisningens formal fra reformationen til enevælden* (Copenhagen, 1982), 130.
- 40 Glebe-Møller, *Doctrina*, 62.
- 41 The 'Novellae Constitutiones' are printed in W. Norvin, *Københavns Universitet I Reformationens og Orthodoxiens Tidsalder*, vol. ii (Copenhagen, 1940), 78–81. See also D. Tamm, *Københavns Universitets Historie*, vol. 1 (Copenhagen, 1991), 210ff.
- 42 Andersen, *Rosenkrantz*, 193ff.
- 43 For the full text of the grant, see *Samling af de for Universitetets Legater gældende Bestemmelser* (Copenhagen, 1888), 484ff.
- 44 O. P. Grell, 'Caspar Bartholin and the Education of the Pious Physician', in O. P. Grell et al. (eds.), *Medicine and the Reformation* (London, 1993), 78–100, especially 93–94.
- 45 For Sorø Academy, see Kaj Hørby et al., *Academia Sorana – Kloster – Akademi – Skole* (Copenhagen, 1962).

- 46 For this, see *Dansk Biografisk Leksikon*, XII (Copenhagen, 1982), 345–346.
- 47 Andersen, *Rosenkrantz*, 214–215.
- 48 For the content of this work which has contributions from others, see *Ibid.*, 287ff.
- 49 Glebe-Møller, *Doctrina*, 11, and *Ibid.*, 311ff.
- 50 For Peder Wandal, see *Dansk Biografisk Leksikon*, vol. 15, 271ff.
- 51 Andersen, *Rosenkrantz*, 317, note 3.
- 52 The confrontation around Rosenkrantz's theology is discussed in detail in *Ibid.*, Chapter 5.
- 53 *Ibid.*, 381–382.
- 54 For Worm, see Grell, 'Acceptable Face', 263.
- 55 See H. D. Schepelern (ed.), *Breve fra og til Ole Worm*, vol. 2 (Copenhagen, 1967), no.1173 (letter from Henrik Motzfeld in Wittenberg to Ole Worm 20 November 1643).
- 56 Cited in Grell, 'Caspar Bartholin', 92.

8 The significance of monstrous births in Thomas Bartholin's natural philosophy

Signe Nipper Nielsen

‘Whatever the truth, there are many phenomena of which we are either ignorant, or, even if we are aware of them, only know without any explanation’.¹

Thus wrote Thomas Bartholin (1616–1680), renowned anatomist, collector, professor and dean of the Medical Faculty at the University of Copenhagen in a letter to one of the founders of the German Academia Naturae Curiosorum, Philipp Jakob Sachs von Lewenhaimb in Breslau. Bartholin corresponded on various topics with Sachs. Among them was a marvellous case of a pregnant foetus born on the Island of Funen in Denmark, on which the above quotation was a comment.²

In the medical historical canon, Thomas Bartholin is celebrated mainly for his discovery of the lymphatic system in humans (in intense competition with Swedish anatomist Olof Rudbeck the Elder), which led him to endorse the rejection of the Galenic theory of the liver as a blood-producing organ.³ The many re-publications of and changes to his late father Caspar Bartholin's anatomical textbook reinforced his position as a key figure in the history of early modern anatomy. In the re-publications, Bartholin moreover included William Harvey's observations on the circulation of the blood, thus being among the first to publicly defend this radical new conception of the workings of the human body.

But apart from these major contributions, the larger, but less well-known body of his work, reveals a rich material, divulging a scholar informed by a fierce zest for knowledge. Bartholin's works spanned medicine and anatomy, natural history, antiquarian studies, philology, theology and *medicina sacra*.⁴ He was a significant member of the European Republic of Letters, an extensive network of regularly corresponding physicians, natural philosophers and natural historians, hence contributing to the vast, collective project of spreading and exchanging natural knowledge across borders and confessions. Bartholin's correspondence shows his vast scholarly cross-European network of erudite men.⁵

The issue of the place of religion in Thomas Bartholin's work still raises more questions than answers. Contrary to his father, physician and theologian Caspar

Bartholin the Elder (1585–1629), Thomas Bartholin was to a lesser extent occupied with religious and theological issues, with some exceptions.⁶ Among these exceptions, one particular genre, *medicina sacra*, merits further attention than offered here. *Medicina sacra*, or biblical medicine, treated the medical aspects of biblical questions. It was a growing intellectual enterprise from the beginning of the seventeenth century, and several of Bartholin's publications both from his early and late years fall under this genre.⁷

In this article, I want to examine the role of religion in another aspect of Bartholin's work, namely his many observations of rare and monstrous births. Bartholin exhibited throughout his work an outspoken predilection for studying marvellous and inexplicable occurrences in nature. We see this partiality for extraordinary natural occurrences notably in his collections of written *historiae*, published in *Historiarum anatomicarum rariorum centuriae 1–6* (1654–1661) and in the periodical that he edited, *Acta medica et philosophica Hafniensia* (1673–1680).⁸ Also his letter correspondence reveals the same fondness for studying the particularities of nature. Of interest for the present essay is moreover the 1664 treatise on the unusual pathways of human births, *De insolitis partus humani viis dissertatio nova*. This treatise is like the title indicates preoccupied with the marvellous. These publications teem with observations of monstrous and other forms of extraordinary births. Bartholin did not explicitly place his observations of rare occurrences in the process of human procreation in a religious context. However, we can still understand his keen fondness for mapping marvellous occurrences in nature ultimately as a religious quest.

In what follows, I shall discuss the difference between the interpretation of monstrous births as portending future divine punishment and Bartholin's more positive representation of monstrous births as outcomes of a playful nature. I will then examine how Bartholin employed the concept of the sports of nature (*lusus naturae*) to explore marvellous and incomprehensible natural phenomena such as monsters. Following this, I will explore a couple of examples of how the process of generation in Bartholin's work was constituted as uncertain and potentially surprising. Lastly, the relationship between religion and the concept of *lusus naturae* will be discussed.

Monsters: omens or natural events?

According to Philipp Melanchthon and his Lutheran followers, body and soul were intimately linked. Medicine, and anatomy, could contribute to the preservation of not only a healthy body, but also a healthy and righteous soul for eternal life.⁹ Subsequently, sin was at least in theory a direct cause of disease and repentance a cure. Especially collective sin or the sinful life of the parents could therefore also have an impact on the birth of monsters.¹⁰

The wonders reported by seventeenth-century naturalists such as Thomas Bartholin echoed earlier and contemporary literature on monsters and other marvels as omens and portents, following the European Reformation and Counter-Reformation.¹¹ Notwithstanding the striking similarities between the two

genres, a naturalist-anatomist, and not a cleric, had collected Bartholin's observations of rare natural phenomena. The interpretation of portentous messages usually fell under the domain of theologians, not physicians.¹²

The prodigy literature assumed that divine intervention was at stake in cases of wondrous events such as the birth of monsters. As it will emerge from the following, Bartholin's natural observations insisted on a natural rather than a supernatural framework, and thus rejected a directly intervening God. Bartholin clearly stated this with a reference to Seneca in one of his *historiae*:

In Rome, monsters of this sort were exhibited and expiated by sacrifice, because they believed that portentous foetuses were never born without a threat of the gods, but [that they] always vowed ill for the republic. But Seneca very elegantly wrote in his *Hippolytus*: You may impute monsters to fate, and crimes to morals.¹³

Following the Europewide trend, also in Denmark-Norway, various pamphlets on prodigies as portents were available in the vernacular or in the German in the seventeenth continuing well into the eighteenth century.¹⁴ Yet, Bartholin was, as said, pursuing natural rather than supernatural (divine) causes, and for him, as a naturalist, there was a need for a different language and a different genre to construct the evidence. The descriptive language employed in the reports of Bartholin attempted to hide the resemblance with the popular prodigy genre, imparted in the cheap print of the sixteenth to eighteenth centuries throughout Europe, and generally considered inferior by the erudite elite.¹⁵ But the similarities were sometimes striking. Both the prodigy literature and the natural observations contained details of place, date and time together with the naming of at least one witness. Moreover, even the broadsheets and pamphlets of the prodigy genre could be purely descriptive.¹⁶ A pamphlet of 1629 for instance, containing among other things an account of a 'wondrous and supernatural birth, seen in Nakskov in the Island of Lolland the 25th of August 1628' (*Vnderlig oc ofuer-naturlig Fødsel, seet i Nagskou i Laaland, 1628, d. 25. Augusti*) contained details of the names of the parents, the time and place of birth and almost two pages of pure description of the monstrous bodily deformities of the child in question. The local pastor in Nakskov, Anders Pedersen Perlesticker, had witnessed the account.¹⁷

The use of these crucial details together with witness testimony that provided validation of the account applied both to the prodigy genre and to Catholic reports of miracles. It was vital to the cultural meaning of the monstrous birth as portent to specify the circumstances of the event in question. The monster was a divine message that pointed both backwards at the sins that called for God's wrath and forwards at what would follow in the form of the punishment itself, which could entail war, famine, plague or other natural catastrophes.¹⁸ The sins committed were mostly, although not always, interpreted as communal, just as the retribution affected the entire community or country. This is evident for instance in the 1665 broadside ballad on a monster born in Christianshavn in

the same year that explicitly interpreted each bodily deformity according to the sins committed by the entire community, and which in that sense is markedly different from Bartholin's *historiae*.¹⁹ Yet, a central difference between the two genres was that the treated natural occurrences in the *historiae* had not necessarily taken place recently or simultaneously, indicating that they were not supposed to be interpreted as portentous. By contrast, the prodigy literature was typically written as soon after the ominous event in question as possible in order to operate as a warning.

In Bartholin's reports on monstrous births and other spectacular natural occurrences, monsters did not portend future divine punishment. There was no notion of collective sin and ensuing divine wrath accompanying the accounts. Likewise, parental sin was not considered a cause of a wondrous birth. On the contrary, the mothers and fathers figuring in Bartholin's accounts were rarely described as disreputable persons in the cases of strange and remarkable births. In many cases, Bartholin stressed the mother's respectability and thence trustworthiness, not least by virtue of her husband. For instance, a report of a monstrous child from Ystad is opened thus: 'On the 3rd of December 1649, the honest matron Maria Jacobsen, wife of Jan Jacobsen from Ystad in Skåne gave birth to a girl with a monstrous face'.²⁰ Another woman, 'wife of an honest citizen of Copenhagen', gave birth to a boy with a crippled hand and a foot that was turned inwards.²¹ The father's occupation was often reported too, such as that of the father of a three-headed '*monstrum horribile*' born 22 April 1652 in Silesia, who was a shoemaker (*sutor*) named Johannes Stein. The mother's name was Katharina.²² A monster from Lolland born 12 July 1677 also had 'pious and honest parents, the father being Johannes Weber, the mother Maria Joachimsen'.²³ In few cases, the social circumstances were more dubious, such as the account reported by Thomas Bartholin's nephew Matthias Jacobæus and published in *Acta medica* on a monster with a 'horrible appearance', born 30 May 1673 in Fredrikshald (today's Halden) in Norway. In this case, 'it is not agreed whether it was [conceived] outside the conjugal bed or not'.²⁴

Bartholin sometimes enhanced the credibility of a given observation by referring to the fact that the woman who had given birth to a certain monster previously had been delivered of healthy and normal children, thus accentuating the singularity of the event. Inger from Lolland out of whose belly were emitted the bones of her twin foetuses, was 'already the mother of three children',²⁵ and Anna Amundsatter from Norway, who had given birth to a hen's egg, 'had in the past happily been delivered of human foetuses many times'.²⁶

Instead of interpreting the birth of monsters as a sign of divine wrath, Bartholin provided a different interpretative framework, namely that of a playful, benevolent nature, contained in the concept of *lusus naturae*. In the following, I will show how *lusus naturae* played a crucial role in Bartholin's work and discuss how this was still compatible with a Christian-Lutheran worldview, albeit different from the notions of sin and monstrosity as described above.

The unknowns of the world: extraordinary products of generation and *lusus naturae*

In a letter correspondence written in 1662 between Bartholin and theologian Jacob Bircherod (1624–1688) from Odense, the two discussed the interpretations of a couple of monstrous births, reported by Bircherod. The first child, ‘still-born and of the inferior sex’ was born in Gundese, The Parish of Ubberud, on the Island of Funen. The thirty-year-old mother, Anna Johannesen, the wife of a farmer, Laurids Nikolaisen, had given birth in the eighth month of her pregnancy to the child, who had

[e]yelids of larger than usual size, almost reaching the size of walnuts, cover[ing] the eyes. Otherwise, the whole face presented the correct and appropriate appearance of a new-born child of such a young age. The back of the head and the neck displayed foul and somewhat horrendous defects: for from the crown of the head as far as the neck there was seen blood-suffused flesh of such appearance that it seemed for the most part not unlike the female adornment intended for the beautification of the head which people call *Valck* [a hair pad]. In the neck there was a deep hole, through the sides of which several passages stretched forth, but they were quite narrow. Nature had made the rest of the little body, as I have said, in such a way that no trace at all of deformity was apparent.²⁷

During her pregnancy, severe pains and frequent movement of the child had troubled the mother. Yet, Bircherod pointed to her piety by underlining that ‘she was never in better health than when she was attending public acts of worship’.²⁸ The case did not seem to have been brought about by maternal imagination, one of the major factors that could exert influence on the workings of the womb in the early modern period. Dating back to antiquity, and prevalent throughout the middle ages, the concept of the influence on the shape of the birth product of the vivid imagination of the pregnant mother figured time and again in early modern reports about strange births, including those of Bartholin.²⁹ In this case, however, according to Bircherod,

as far as she knew, [the mother in question] had scarcely ever, so long as she had lived, seen the kind of feminine adornment to which the head of her unfortunate little daughter bore a resemblance; nor had she, when pregnant with that ominous foetus, conceived in her mind a picture of it.³⁰

The parents initially wanted to conceal their monstrous daughter ‘for fear that the general public would place a sinister interpretation of the chance happening, as it customarily does’. Yet, ‘foolishly fearing that, if they dissimulated’, they would beget another similar monstrous child, they decided to show their child to among others the bishop of Odense Laurids Jacobsen. Their fear was

based on another case of a woman who gave birth to two monstrous children with more or less the same appearance.

Bircherod then fervently rejected the seemingly widespread supposition especially among clerics that monsters were signs of communal sin; in this case the sinfulness of female adornment and fashion.

Clerics keep trying to persuade people that those monstrous malformations of the head were demonstrating the viciousness and depravity of feminine adornments. But me? Never. I think of the thousand kinds of apparel, which have been customary since the first beginnings of the world, and I do not see why one should be more offensive to God than another, and hence I attribute these wrongs, and others of the kind, to the imagination.³¹

Also the second monstrous birth reported by Bircherod could be interpreted as a portent 'reprimanding women for the detestable foulness of their fashions of dress'. Yet, Bircherod noted that he had very little respect for this kind of 'superstition', and asked Bartholin his opinion.

In his answer to Bircherod, Bartholin initially praised Bircherod for regarding 'in a favourable light those beings which Nature sometimes brings to birth imperfect'. Bartholin refers to the central role of the benevolent playfulness of nature in the shaping of these kinds of aberrations.

I would venture to say that Nature would be monstrous if she did not occasionally play games [as] in these monstrosities, in view of the variable-ness of circumstances – where there is either an excess of raw material or an insufficiency, or an efficient cause is not functioning in its role because of some impediment. Thus, nature would be monstrous if she did not form twins in the event of abundance of raw material, or in the event of shortage did not produce a foetus in some respect deficient.³²

Moreover, Bartholin likened monstrous births to other natural wonders, including the double appearance of the Sun or the Moon, eclipses of the Sun, snow in summer, noise in quiet places and so on, and noted that they might even proceed from them.³³

What is of importance in this letter for our understanding of Bartholin, however, is the notion of monsters as signs of a benevolent nature, not of sin. As said, Bartholin was inclined towards the observation of extraordinary occurrences in nature and in this sense he was particularly concerned with the domain of the preternatural. Yet, he attributed as many strange phenomena as possible to the plays of nature. Thus, in most cases he ascribed the often-erratic process of generation to the jokes of nature. The concept of *lusus naturae* was therefore central in his work.

Bartholin partook of an erudite culture whose study of nature was largely governed by notions of playfulness and wonder. Nature, for Bartholin, did not have laws, but customs. This made room for a constitution of nature as wilful,

occasionally capricious, and able to follow irregular paths.³⁴ Nature was therefore in a constant process of transformation. We also see this aspect of natural inquiry for instance in the contemporary German journal *Miscellanea Curiosa* and in the works of the founders of the Academia Naturae Curiosorum. 'Nature is never idle', Philipp Jakob Sachs wrote in his work on crustaceans. *Natura numquam otiosa* was also incorporated in the motto of the German academy: *Numquam otiosus*.³⁵

In the sixteenth and seventeenth centuries, natural and scientific playfulness had been rediscovered from ancient thought in the concept of *lusus naturae*, *lusus* meaning 'joke', 'play' and 'sport'.³⁶ In the renaissance, *lusus* was employed as a sort of organising principle, which ordered and described all the new things observed in the natural world that were not included in ancient works; natural things that were not known by the time of Pliny, but which now, not least as a consequence of the discovery of the new world, overwhelmed the naturalists in their abundance. By searching for disorder and highlighting unusual phenomena, *lusus*, as a sort of epistemological structure, emphasised the complexity of and inherent paradoxes in nature and grasped exactly that richness and ceaseless variation that seemed to characterise God's outstanding creation.³⁷ Like Renaissance natural inquiry generally, it was a reconciliation of ancient thought with new ways of seeing and observing.³⁸

Lusus figured repeatedly in Thomas Bartholin's work. He thus diverted from the approaches to natural inquiry that marked the work and aspirations of Cartesian and Galilean naturalists and members of the early Royal Society in Britain with their rejection of *lusus* as a viable way to comprehend nature.³⁹ However, in contrast to other naturalists, according to Paula Findlen's reading of *lusus naturae*, Bartholin used *lusus* also as a way also to understand monstrous births such as the two monstrous children discussed in the correspondence with Bircherod. Findlen stresses that the jokes of nature were not the same as marvels or prodigies.⁴⁰ However, here, I want to argue that at least for Bartholin, preternatural events such as marvels and wonders, including monstrous births, were included under the realm of *lusus*. Bartholin did not explore the supernatural in the works examined here, only the natural and especially the preternatural sphere.⁴¹

For Bartholin, it was above all in generation that nature tended to go astray, which he clearly expressed in the opening passage of *De insolitis*, where we see how the conception of nature and the conception of generation went hand in hand and informed each other:

Nowhere does nature variegate to a greater extent than in human generation, and in the continuing act of childbirth, it continuously shows inconsistency. For either the time of the birth is prolonged and is defined by an uncertain duration, or numerous foetuses are brought forth, or the birth product is monstrous in the body as in the soul.⁴²

Bartholin's natural inquiry, in this case into generation, was inspired by a notion of nature as powerful and playful, changeable and prolific of marvels.

Accordingly, generation was constituted as a complex process, potentially with a variety of results.

The concept of nature's ceaseless variety patently marked Bartholin's observations on generation throughout his work. Again, in the opening chapter of the treatise *De insolitis*, he stated:

Certainly, in the journey of nature, where perfect foetuses are brought forth, it [nature] seems largely to preserve persistence and continuity, but it nevertheless sometimes deviates from a familiar path and chooses a new way by nothing larger than the wonder of life, as if it felt aversion to the tedious custom of parturition, and because of aversion to the old ways, it searches for new paths.⁴³

Nature here figures as an almost independent agent with certain qualities. She could be patient and enduring and she had the power to choose.⁴⁴ She possessed imagination and she was able to diversify. She was the artist in God's magnificent creation.⁴⁵

The interpretative framework of the concept of *lusus naturae* is also exemplified in the following case of the pregnant foetus, already mentioned briefly. This notable case was rendered in the sixth and last century of *Historiarum anatomicarum rariorum* (1661):

Some years ago in the town of Aunslev in the parish of Ullerslev on Funen next to Nyborg, a certain woman, the wife of the farmer Niels Petersen, Johanne, who had been in labour for some days, could not give birth, even though two ordinary midwives had attended her. Whence she called for a third midwife from the neighbourhood with greater reputation and experience, named Sidsel. After great efforts, she [the midwife] finally accomplished to deliver the parturient woman and rescue her from death, but the foetus of the inferior sex was dead. Whilst the midwife and the mother of Johanne were washing the body of the foetus and prepared it for the burial, they were marvelled at the swollen belly of the foetus, inside which, at touching it, it seemed that something osseous was hidden. After some debate the grandmother opened up the belly of the foetus with a little knife, and O wonder! inside the foetus another foetus of female sex was found, situated in the habitual place; it was fully developed with all limbs, about the length of a span, furnished with nails and hair like a perfect foetus; and as the former foetus which was emitted from the mother was livid and its flesh blackish, just as dead foetuses usually are, so the smaller foetus had a whitish appearance and was provided with healthy flesh, so that from all evidence the grandmother concluded that it had been viable. Neither did it lack the placenta, by which it was connected with the uterus of the foetus.⁴⁶

Bartholin marvelled at the observation of the pregnant foetus and only because he had been persuaded by worthy witnesses (*dignis testibus*) did he believe it.⁴⁷

Yet, he also reinforced the reliability of the account, asserting: 'to such a degree, many monstrous things are brought forth in the course of nature, and to such a degree our century is fertile with things differing from the quotidian'.⁴⁸ In the treatise *De insolitis*, Bartholin returned to this remarkable case and attributed it to nature's play. Out of fear of losing her 'reputation or fortune',⁴⁹ the poor woman Johanne had wished to conceal the birth of her foetus that seemingly was pregnant with another foetus, 'just as if this poor thing [Johanne] ought to take the blame for a playful nature [*Naturae ludentis*]'.⁵⁰

In a letter to Bartholin from 1663, his colleague Philipp Jakob Sachs also remarked upon the pregnant foetus by referring to several other similar instances. Juan Eusebio Nieremberg for instance had given an account of a mare in Spain, which had given birth to a mule pregnant with another mule. And Sachs continued: 'The mockery of nature (*Naturae Ludibria*) in the vegetable kingdom is very well known to your honoured self, too; in the process of maturation she produced those 'foetuses' or 'pregnant fruits in certain lemons'. In one of these,

there was a small fruit inside, which also had a yellow rind, white pith and a juicy part separated into its own tiny segments. Nature, so polydexterous, is never idle, but for the inquisitive spectator she daily exposes things not perceived by the ancients, to be exclaimed at, to be explored.⁵¹

Here we see how *lusus* was employed explicitly to describe the new natural phenomena that were not included in the works of the ancients. As such, *lusus* was also a way of observing nature – of collecting and describing everything new and unheard of, and therefore a significant concept of early modern empiricism.

A much-debated instance among naturalists at the time of Bartholin was a foetus of Pont-à-Mousson in France, which had been found turned into stone and lying outside the womb of a woman. Commenting on this case, Bartholin wrote to his former mentor in Paris, Gui Patin, that although the case might be a counterfeit, 'it is impossible to describe how fruitful of monsters this age is'.⁵² He continued, most probably referring to a case, which was also of great concern to him, namely that of a woman named Inger from the island of Lolland, who experienced a particularly unusual birth:

Recently, I was presented with a great number of largish bones from a foetus, which, not so long ago, had appeared out of a woman's ruptured navel after she had been impregnated sixteen years earlier. She still lives among us and every year she suffers these crises with the bones. So Nature plays games with our procreation. Yet, what route can there be from a mother's womb to her navel? Nevertheless, a similar phenomenon has also been observed by Albukasis, Donati, Cagnati and Lange. We are amazed at the fact, but we are ignorant of the paths.⁵³

Here, Bartholin directly mentioned the sports of nature and not least pointed to the ignorance of men, which was coupled with the sense of wonder and

amazement that affected mortals when confronted with the unknown. As the latter as well as the introductory quotation indicate, Thomas Bartholin and his peers often highlighted their insufficient knowledge of natural phenomena, not least of those that were extraordinary. One way to approach the ‘unknowns’ of the world was the employment of the concept of *lusus naturae*. By employing *lusus*, the naturalist could point to the extraordinary paths taken by nature, and as such emphasise the wealth and intricacy of God’s creation.

The uncertain process of generation

Implied in Bartholin’s observation-based studies, there was a notion of generation as an uncertain process with unpredictable results. Because of Bartholin’s great concern with the preternatural and the playfulness of nature, the products of generation that appeared in his work either assumed rare and extraordinary shapes or were surrounded by a curious and rare narrative.

The observation of the process of generation was a major concern for Bartholin. As we have seen, he believed that the process and outcomes of generation were particularly fruitful with marvels to an even greater extent than elsewhere in nature. This was probably the major reason why he gave this subject so much attention. The preoccupation with extraordinary, incomprehensible and singular events in the process of generation was a highly serious quest for Bartholin. It was a part of his contribution to an empirical natural inquiry and a means to map and intellectually possess and master the most intricate matters of the known world. With his extraordinary accounts, Bartholin fashioned himself as a significant contributor to this relatively new type of natural inquiry.

Together with the centrality of curiosity and playfulness in the concept of nature in early modern learned discourse, the deep concern with the marvellous and with natural particulars that Bartholin demonstrated had a significant bearing on the products of generation that figured widely in his work. They were staged as exceptional, singular and rule breaking, and they consequently assumed surprising forms, crossed species, or found uncommon pathways out of the body. Bartholin’s scholarly concerns were with particulars, diversity and disorder rather than with universals, regularities and taxonomy, and these were reflected in his focus on extraordinary and unprecedented outcomes and events related to generation.

In the following, I shall examine a couple of Bartholin’s observations of molar pregnancies, which emerged in various and diverse forms. Moles (*molae*) were one of the many outcomes of an early modern pregnancy, and treated by Bartholin in several observations.⁵⁴ Bartholin’s moles did not take human form, and they sometimes assumed more extraordinary shapes by mimicking forms found in nature, reminding the reader about the mutability of the products of the human body.

In one of his *historiae*, Bartholin meticulously described an amorphous mole he had dissected.⁵⁵ With this *historia*, he first and foremost wished to stress the diversity and polymorphous character of moles in a playful nature. Following

the description of the dissected mole, he referred to a variety of strange looking moles with distinct forms observed by ancient and Renaissance medical authorities from Hippocrates onwards. Moles observed by among others Felix Plater, Levinus Lemnius, Wilhelm Fabry, Pieter van Foreest and Salius (Bartholin probably refers to Pietro Salio Diverso) had notable characteristics, according to Bartholin. One resembled a starfish growing into a tree.⁵⁶ One 'had two ears attached on both sides stretched out in length, style and measure like arms, similar to a sea nettle'.⁵⁷ Various forms of moles with eyes had been observed; also one with a hawk's beak, and one mole clearly resembled a penis.⁵⁸ Naturalists had also reported on a mole that resembled 'a toad with a rictus or an open crack of the mouth' and moles with beaks and wings.⁵⁹ Precisely this variability underlined the accidental character of their formation: 'Because the forms of the moles are various, and never similar to each other, they are rather formed by chance and variety of place'.⁶⁰ These marvellously shaped *molae* suggested that human bodies could generate creatures resembling animals, minerals and plants.

Another case of extraordinary generation concerned flying moles. A 'four-footed bird' had been reported, which seemingly was emitted from a woman's womb. The skeleton of the bird was kept in the private museum of the principal at the Academy of Sorø, Jørgen Rosenkrantz (1607–1675), 'here exposed publicly to the eye of everybody'.⁶¹ It is not known, however, how Rosenkrantz had procured this highly unusual creature. *Acta medica* provided an illustration of the skeleton of the bird. Bartholin explained in the following what kind of beast that was.

That mole is familiar in the Netherlands, where it is called *Suygers* by the common people, a sort of leech infesting and bruising the foetus. Similar as that which Levinus Lemnius describes in the first book of 'On the Secret Miracles of Nature', ch. 8. In our city there are several wives, who put forth a mole of such kind, taking great care that it is not easily known. It comes forth after the foetus in childbirth, and it will be flying around the corners of the bedroom, and it thus upsets the women who chase it with great zeal, so that having caught it they can burn it, believing that unless it is completely burned, a little bird will come from it, so that it enters again into the hiding places of the womb, which if returned to, the woman in labour will die. It is also observed sometimes that the foot of the foetus has been bitten by it in the womb.⁶²

Bartholin was in no doubt that these flying creatures were *monstra*. Following the conventions of the genre in which he wrote, the *historia*, he did not provide a causal explanation, but he could not resist asking the open question, how the parental seed could turn into that kind of creature in the womb and bring about small insects and birds.⁶³

Parasitic creatures accompanying a 'normal' foetus and typically expelled with the afterbirth were rather common figures in early modern medical literature.⁶⁴ The *de Suygers* or *sooterkin*, as mentioned in the above by Bartholin,

was believed to trouble pregnant women, especially in the Netherlands.⁶⁵ The women in Copenhagen feared this powerful and dangerous creature too. And elsewhere, Bartholin recalled the beliefs and practices of Neapolitan women, probably from his own travels, who

frequently give birth, either before or after the foetus, to a fleshy mole, enclosed in its own sack, which they call *fera* [a wild beast]. Concerning that *fera* superstitious women believe that: If it touches the ground, the mother will die of a fit. In order to prevent this inconvenience, they always lay a blanket [on the floor in order to prevent the *fera* from touching it], then they immerge and twist it into water, and finally they chuck it down the drain.⁶⁶

The products of generation described by Bartholin repeatedly crossed boundaries and violated categories. The flying mole, for instance, destabilised the boundary between man and beast.

Besides, Bartholin's frequent use of homologies and analogies, central principles in taxonomy before Linnaeus and a central feature of *lusus*, added further to a sense of estrangement and disruption of boundaries.⁶⁷ The mature foetus was for instance likened to 'a ripe fruit on a tree', and if it died, it was equated with a fruit that 'goes rotten and dries up left on the tree, or falls to the ground, and is bruised', if it is not plucked by the gardener.⁶⁸ In a letter to Johan Daniel Horst in Darmstadt from November 1660, Bartholin elaborated on this subject at length. Among other things he wrote:

Nature produces likenesses of parts of the human body everywhere, in stones, plants, and shells, and in some things a whole person is depicted. The mandrake root looks like a little man, just as the root of the fern when dissected resembles an eagle. The walnut reveals a likeness to the whorls, membranes and ventricles of the human brain, which are also indicated by the musk nut, but less clearly. Ragwort resembles the testicles, lungwort the lung, and hazelwort the kidneys.⁶⁹

In the same letter, we are also acquainted with the fact that anomalous tumours inside the body could take different shapes, which resembled humans.

The projecting tumour of [a] girl . . . resembled the head of an infant distinguished by eyes, nose and mouth, rivalling it in appearance. . . . The cancers also reveal a variety of shapes with their unequal protuberances, especially those that are ulcerated. Last year we rooted out from the abdomen of a respectable woman a cancer not unlike the head of an infant.⁷⁰

Again in these cases, jokes of nature generated these unusual forms that crossed the usual boundaries of nature.

***Lusus* and God's creation**

I have so far shown that Thomas Bartholin's reports on unusual phenomena did not have as their purpose to highlight God's punishment neither of an entire community nor of the parents of a monstrous birth. Rather, Bartholin wanted to throw light on the beneficial and productive aspects of nature as well as what was ultimately incomprehensible to human beings. Yet, this does not mean that Bartholin's natural inquiry was not a religiously motivated pursuit. Rather, I will suggest that this adherence to *lusus* among other things should be seen as a response to the contemporary challenge of Cartesianism and mechanical philosophy. Although Bartholin rarely referred to Descartes, he explicitly disagreed with the mechanistic interpretation of the child in the womb in his republication of his father's anatomy book. In Thomas Bartholin's view, the mechanistic model of the formation of the child undermined the Christian belief in the soul and ultimately God's hand in the creation of man. This concerned him:

I cannot as yet perswade my self, that all things are done rudely and mechanically in the Body, who have alwaies had a higher Opinion of nature then so. By this means a Man were an accidental Being, and his first shaping would be accidental and fortuituous, or by chance medley. . . . [However], the Divine Shape of the most noble Creature Man, is alwaies one and the same, and happens of itself after the same manner. How could that Branch be formed without the Mind, which is not in our Hands? I profess I know not.⁷¹

Thus instead, Bartholin insisted on the Christian belief that the child was animated.⁷²

For Bartholin, the employment of the playfulness of nature as an organising principle in the study of nature was a deeply serious enterprise. I will suggest that he represented what Ann Blair in her work on Jean Bodin has called 'an antirationalist position'. According to this, natural phenomena are morally uplifting because they are unfathomable to man.⁷³ Likewise, we can assume that for Bartholin, the inscrutable ways of the Creator were illustrated in the marvellous occurrences and things that were effects of nature's jokes. Hence, the quest for the unintelligible in Bartholin's work was ultimately a moral and religious achievement, a praise of God through wonder, which at the same time stressed the inferiority of man towards the divine. The workings of the divine architect were beyond man's understanding. And it was exactly in the study of preternatural occurrences and the jokes of nature, where no causal explanation was evident, that wonder was constituted. Thus, the observations of marvellous occurrences in human generation and the great concern with the effects of *lusus naturae* were expressions of a natural inquiry whose ultimate purpose it was to point to God's footprints in the material things on earth, thus following the original Melanchthonian intent with natural philosophy.

As various historians have noted, again in the words of Ann Blair, ‘in a world where so many things, both natural and supernatural, are not understood, and in which everything is within God’s power, almost no report or experience can be rejected as unbelievable a priori’.⁷⁴ However incredible and astonishing, what was observed in nature could discredit human reason, frail and largely inferior as it was to the infallible and supreme wisdom of God.⁷⁵

Bartholin’s work is marked by the centrality of *lusus naturae* combined with a search for the incomprehensible aspects of nature for religious and moral purposes. The version of nature that emerged in Bartholin’s studies of generation, not least in the *historiae*, was closely related to the way in which the process of generation was conceived. As it transpires from the quotations above from *De insolitis*, nature’s deviations and her fondness for play, not least when she was seized by boredom, led her to give way to unusual and marvellous products of generation. A playful nature generated playful birth products in a variety of shapes, often marked by transgressive qualities. As Bartholin underlined, it was moreover especially in the process of generation that nature was most capricious. It was here that the majority of marvels in the natural world took place.

Notes

- 1 ‘Quidquid sit, multa sunt quæ vel ignoramus, vel, quancquam cognita, sine ratione scimus’. 4.63. ‘De rebus variis imprægnatis’, To Philipp Jakob Sachs von Lewenhaimb. Thomas Bartholin, *Epistolarum medicinalium centuria IV* (Copenhagen, 1667), 387. Niels W. Bruun, The Royal Library, Copenhagen, has generously made translations of Bartholin’s letters available to me. Bartholin’s letters are soon to be published in English translation with Niels W. Bruun as editor and the following four translators: Peter Fisher, John Blundel, Janet Fairweather and Caroline White. Yet, responsibility for any errors or shortcomings is entirely my own, as the translations are still being edited.
- 2 Research for this article was supported by the Wellcome Trust, grant no. 074298.
- 3 Bartholin published his findings in Thomas Bartholin, *De lacteis thoracis in homine brutisque nuperrime observatis historia anatomica, publice proposita, resp. Mich. Lysero* (Copenhagen, 1652).
- 4 Axel Garboe, *Thomas Bartholin: Et Bidrag til dansk Natur- og Lægevidenskabs Historie i det 17. Aarhundrede*, vol. 1 (Copenhagen, 1949), 49, 61. The most exhaustive list of Thomas Bartholin’s many publications is found in Holger Ehrencron-Müller, *Forfatterlexikon omfattende Danmark, Norge og Island indtil 1814*, vol. 1 (Copenhagen, 1924), 277–290.
- 5 Thomas Bartholin, *Epistolarum medicinalium centuria I–IV* (Copenhagen, 1663–1667). On the republic of letters, see among others Adam Mosley, *Bearing the Heavens: Tycho Brahe and the Astronomical Community of the Late Sixteenth Century* (Cambridge, 2007). Also Paula Findlen, ‘The Formation of a Scientific Community: Natural History in Sixteenth Century Italy’, in Anthony Grafton and Nancy G. Siraisi (eds.), *Natural Particulars: Nature and the Disciplines in Renaissance Europe* (Cambridge, MA, 1999), 369–400.
- 6 In 1678, he published a Danish translation of *De veritate religionis* by Hugo Grotius. See also *En eenlig Enckis Sørge og Trøste-Stand*, likewise from 1678.
- 7 Ole Peter Grell, ‘Review of *On diseases in the Bible: a medical miscellany, 1672*’, *Medical History* 41, no. 3 (1997), 406–407.
- 8 Henceforth, I shall refer to these volumes primarily as the *Acta medica*. When referring to these *historiæ*, I will either make use of that same Latin term or its synonym, *observationes*. Alternatively, I shall refer to them as histories or observations, or more generally as ‘reports’, ‘accounts’ etc. The same applies to the observations in *Acta medica*.

- 9 Vivian Nutton, 'Wittenberg Anatomy', in Ole Peter Grell and Andrew Cunningham (eds.), *Medicine and the Reformation* (London, 1993), 11–32, 11–12, 20–21. For the Melanchtonian influence at the University of Copenhagen and the relationship between theology and medicine in Denmark, see Morten Fink-Jensen, *Fornuften under Troens Lydighed: Naturfilosofi, Medicin og Teologi i Danmark 1536–1636* (Copenhagen, 2004), esp. 180–193, and Morten Fink-Jensen, 'Medicine, Natural Philosophy, and the Influence of Melanchton in Reformation Denmark and Norway', *Bulletin of the History of Medicine* 80 (2006), 439–464.
- 10 Fink-Jensen, 'Medicine', 459–462.
- 11 Lorraine Daston and Katharine Park, *Wonders and the Order of Nature 1150–1750* (New York, 2001), 246–249.
- 12 Ian Maclean, *Logic, Signs and Nature in the Renaissance: The Case of Learned Medicine* (Cambridge, 2002), 270.
- 13 'Romæ hujusmodi monstra exponebantur & lustrata procurabantur, quia nunquam sine Deorum comminatione foetus portentosos nasci sed mala semper Reipublicæ portendere crederent. At eleganter Seneca in Hippol: *Monstra fato, moribus scelera imputes*. 2.44. 'Varia monstra humana passim observata', Thomas Bartholin, *Historiarum anatomicarum rariorum centuria I-II* (Copenhagen, 1654), 211. Thanks to Niels W. Bruun for calling attention to the fact that Bartholin is mistaken as to the reference to Seneca. The quotation is from *Phaedra*, 144.
- 14 Examples of Danish pamphlets (including ballads) on monstrous births are Jens Pedersen, *En Sandferdig Beretning Som Sig Er Tildraget Med Et Vanskabt Oc Wtidigt Død Drengefoster Den 29. Novembris I Forgangne Aar 1640 Udi Jydland I En Landsby Ved Naffn Brøns Liggendis Imellen Viborg Oc Ribe. Aff Ærlig Oc Ecte Forældre Deris Første Barn*. (Copenhagen, 1641); Ludw. Hanssen Munthe, *En Sandferdig Beretning, Om Nogle Selsomme Oc Underlige Fødseler Udi Bergen Stifft, Sampt En Kort Oc Enfoldig Underviszning Der Hos, Om Huis Wi Hos Saadanne Vandskabte Fødseler Kand Haffue Osz at Erindre* (Copenhagen, 1641); *Relatio Nova De Contributione Rediviva, Das Ist: Schreckliche Miszgeburt Eines Vberaus Ohnnatürlichen Kindts, Welches Im Jahr 1641 Zu Coppenhagen Geboren Worden, Und Schrecklichen Schaden in Gantz Teutschland Angerichtet Hat* (Copenhagen, 1645); *Vis Oc Sand Beretning Om Det Vanskabt Foster, Som Bleff Fød Her Udi Byen Paa Christianshaffn Udi Janvarij Maaned, Aar 1665 Hvis Legems Skickelse Eractis Aff Med Følgende Dict, Sangvis under Den Melodie: Kommer Til Mig Sagde Guds Søn Etc. Forfattet Hvor Med Gud Ligesom I Et Klart Speil Stiller Os for Øyene Hvad Hannem Ilde Behager, Oc Tillige Med Indbyder Os Til Poenitentze, Bod Oc Bedring* (Copenhagen, 1665); *Een Nye Viise Om En Huusmands Kone Boende En Halv Miil Fra Den Stad Winger Faa Miile Fra Christiania I Norge, Som Sidstleden 4. April 1720, Fødde Et Vanskabt Foster Ligesom 2 Pige-Børn Med Alle Fuldkomne Ledemoder, Som Havde 2 Hoveder Og Gevexter Derudi Ligesom En Fontange, Havde 4 Arme Og 4 Fødder Men Ickun En Mave, Som Disse 2de Corpora Vare Ved, Hvilcket Foster En Times Tid Efter Fødselen Døde; Udi Riim Befattet, under Dend Melodie: Vender Om Med Poenitentze* (n.p., 1720). These pamphlets, published in the seventeenth and eighteenth centuries, are kept in the Danish Royal Library. Although the Royal Library was entitled copies of all works printed in the Kingdom as from 1697 – the rules changing and periodically brought to a halt until 1781, when the legislation was fully carried out in practice – this kind of cheap literature was in practice normally not deposited in the period, following verbal or tacit agreement with the printers. Thanks to Jesper Jakobsen for this point. See Harald Ilse, 'Fra bytteobjekt til nationalobjekt: Pligtafleveringen 1697–1783', in *Den trykte kulturarv: Pligtaflevering gennem 300 år* (København, 1998), 22.
- 15 Daston and Park, *Wonders*, 246–249.
- 16 *Ibid.*, 181–182.
- 17 *Vnderlig Oc Ofuer-Naturlig Fødsel, Seet I Nagskou I Laaland, 1628, D. 25. Augusti Oc Blod-Tegn Som Nu Nylig Ere Seet Baade Udi Fyen, Nu Sidst Forleden Juledag, Tisdagen Oc Løfuerdagen Der Efter, I Vindinge Prestegaard: Disligeste Oc Udi Siæland, I Holboe Herret, Udi*

- Blistorp Sogn, 1629 D. 16. Januarij: Med Underskrefne Sandfærdige Vidnesbyrd, Som Sligt Seit Oc Fornummit Hafue* (Copenhagen, 1629).
- 18 Daston and Park, *Wonders*, 181–182. On miracle testimonies, see *ibid.* 247. The reading of signs as a central element in medical theory and practice bears a strong resemblance to the reading of another kind of signs, namely warnings. Both are ways to understand the natural world. On signs, see Maclean, *Logic, Signs and Nature*, esp. 276–332.
 - 19 *Vis Oc Sand Beretning Om Det Vanskabt Foster, Som Bleff Fød Her Udi Byen Paa Christianshaffn Udi Janvarij Maaned, Aar 1665 Hvis Legems Skickelse Eractis Aff Med Følgende Dict, Sangvis under Den Melodie: Kommer Til Mig Sagde Guds Søn Etc. Forfattit Hvor Med Gud Ligesom I Et Klart Speil Stiller Os for Øyene Hvad Hannem Ilde Behager, Oc Tillige Med Indbyder Os Til Poenitentze, Bod Oc Bedring.* Moreover, Daston and Park, *Wonders*, 181–182.
 - 20 ‘Honesta Matrona Maria Jacobi uxor Jani Jacobi Ystadi Scanorum enixa est 3. Dec. 1649. puellam monstrosa facie’. 1.8. ‘Monstrum Ystadiense’, Bartholin, *Historiarum centuria I–II*, 19.
 - 21 ‘uxor honesti Civis Hafniensis’, 2.1. ‘Gravidarum imaginatio’, Thomas Bartholin (ed.), *Acta medica et philosophica Hafniensia*, vol. 2 (Copenhagen, 1675), 2.
 - 22 6.49. ‘Monstrum Triceps’, Thomas Bartholin, *Historiarum anatomicarum rariorum centuria V–VI* (Copenhagen, 1661), 278–279.
 - 23 ‘parentibus piis & honestis, Patre Johanne Weber, Matre Maria Joachimi’. 5.127. ‘Monstrum Lalandicum’, Thomas Bartholin (ed.), *Acta Medica et Philosophica Hafniensia*, vol. 5 (Copenhagen, 1680), 323.
 - 24 ‘an extra thorum conjugalem nec ne, non constat’. 2.33. Matthias Jacobæus: ‘De Monstro Norwegico’, Bartholin (ed.), *Acta Medica*, vol. 2, 80.
 - 25 ‘Ingera, trium ante liberorum Mater’. Thomas Bartholin, *De insolitis partus humani viis dissertatio nova. Accedunt Johannis Veslingi equitis De pullitie Ægyptiorum et aliæ ejusdem observationes anatomicæ et epistolæ medicæ posthumæ* (The Hague, 1740), 3. I use the 1740 edition throughout the article.
 - 26 ‘Anna . . . qvæ sæpius ante humanos foetus feliciter enixa fuerat’. 1.4. ‘Ovum peperit mulier’, Bartholin, *Historiarum centuria I–II*, 12.
 - 27 ‘Oculos grandiora cilia, ad magnitudinem juglandium propè accedentia, tegebant. Vultus alioquin totus justam decentemque tantulæ ætatis partus speciem referebat. Occiput & cervix fædos, horrendosque aliquantulum errores ostentabant: à vertice namque ad cervicem cruenta visebatur eä facie caro, ut mundo muliebri, qvem *Valck* vocant, capitis cultui destinato, haud absimilis potiore parte videretur. In cervice hiatus erat profundus, per cujus latera meatus aliquot, sed contractiores, porrigebantur. Cæteras corpusculi partes ita, ut dixi, effinxerat natura, ut nullum penitus deformitatis vestigium appareret’. 3.75. ‘Monstra Fionensia’, From Jacob Bircherod. Thomas Bartholin, *Epistolarum medicinalium centuria III* (Copenhagen, 1667), 312.
 - 28 ‘rectius nunquam valuisse, qvàm cùm sacris publicis interesset’. *Ibid.*, 313.
 - 29 A quite large amount of literature on the topic of maternal imagination in the medieval and early modern period has been produced, and it is included in many works on the history of early modern generation. See above all Marie-Hélène Huet, *Monstrous Imagination* (Cambridge, MA, 1993); Philip K. Wilson, “‘Out of Sight, out of Mind?’: The Daniel Turner-James Blondel Dispute over the Power of the Maternal Imagination’, *Annals of Science* 49, no. 1 (1992), 63–85; Dennis Todd, *Imagining Monsters: Miscreations of Self in Eighteenth Century England* (Chicago, 1995); Mary Fissell, *Vernacular Bodies: The Politics of Reproduction in Early Modern England* (Oxford, 2004), esp. 207–211; Katharine Park, *Secrets of Women: Gender, Generation, and the Origins of Human Dissection* (New York, 2006), esp. 145; Maaike van der Lugt, *Le ver, le démon et la vierge. Les théories médiévales de la génération extraordinaire: Une étude sur les rapports entre théologie, philosophie naturelle et médecine* (Paris, 2004), esp. 127–128. See also Cesare Taruffi, *Storia della teratologia*, vol. 1 (Bologna, 1881), 227–250.

- 30 'totâ, qvôd sciret, ætate vix ejus generis, vidisse κὸσμον γυναικεῖον [*kosmon gynaikeion*], qvem infelicis filiolæ caput referebat; nec utero infausto gravidam ejus imaginem animo se concepisse . . .'. 3.75. 'Monstra Fionensia', Bartholin, *Epistolarum centuria III*, 313.
- 31 'Monstrosas illas capitum formas ornamentorum fæmineorum vitia & pravitates monstrare Sacris initiati persuadere connituntur: Sed mihi nunquam, qvi, cùm mille mundorum à primis mundi cunabulis usitatorum species cogitem, nec cur una Deo sit aliâ invisior dispiciam, imaginationi hæc aliaqve ejus generis, delicta tribuo'. 3.75. 'Monstra Fionensia', Bartholin, *Epistolarum centuria III*, 314.
- 32 'Ausim dicere, monstrosam fore naturam, nisi in his monstribus subinde luderet, pro varia causarum conditione, ubi vel materia excedit vel deficit, vel efficiens partibus suis propter aliquod impedimentum non fungitur. Ita monstrosa foret natura, nisi in materiæ copia gemellos efformaret, vel inopiâ deficientem aliqua parte foetum produceret'. 3.76. 'Benignum de Monstris judicium', Bartholin, *Epistolarum centuria III*, 319.
- 33 3.76. 'Benignum de Monstris judicium', Bartholin, *Epistolarum centuria III*, 320.
- 34 On changing concepts of nature in the early modern period, see also Lorraine Daston, 'The Nature of Nature in Early Modern Europe', *Configurations: A Journal of Literature, Science, and Technology* 6 (1998), 149–172.
- 35 Pigeaud, Jackie, 'L'Académie des Curieux de Nature', in Jean-Paul Barbe and Jackie Pigeaud (eds.), *Les Académies (antiquité – XIXe Siècle): Sixièmes 'Entretiens' de La Garenne Lemot* (Sainte-Foy, Québec, 2005), 215–231, 220.
- 36 Paula Findlen has most clearly described the concept of nature as playful. Paula Findlen, 'Jokes of Nature and Jokes of Knowledge', *Renaissance Quarterly* 43, no. 2 (1990), 292–331; Paula Findlen, 'Between Carnival and Lent: The Scientific Revolution at the Margins of Culture', *Configurations* 6, no. 2 (1998), 243–267.
- 37 Findlen, 'Jokes', 294, 325, 328.
- 38 Ibid., 295.
- 39 Findlen, 'Between Carnival and Lent', 262 and specifically on Hooke's rejection of *lusus*, 264, and 266 for Fontenelle's rejection of the concept of *lusus* as regards monsters. Moreover, Findlen, 'Jokes', 294–295.
- 40 Findlen, 'Jokes', 303, 306.
- 41 For the complex relationship between the natural, the preternatural and the supernatural, see among others Daston, 'Nature of Nature'; Daston and Park, *Wonders*; Stuart Clark, *Thinking with Demons: The Idea of Witchcraft in Early Modern Europe* (New York, 1997).
- 42 'Nusquam magis quam in humana generatione variat Natura, & in constanti puerperii actione inconstantiam suam monstrat constantissimè: Vel enim partus tempus prolongatur & spacio incerto definitur, vel numerosi foetus eduntur, vel monstrosi tam corpore quam animo'. Bartholin, *De Insolitis*, 1–2.
- 43 'Qvamquam verò in via Naturæ, qva perfecti foetus excluduntur, constantiam aliquam & perpetuitatem servare videatur aberrat tamen nonnumquam & hic à trita via, novamque eligit nullo vitæ miraculo majore, qvasi longa parturiendi assvetudine defatigatam fastidiat, & antiquarum tædio, novas semitas qværat'. Bartholin, *De Insolitis*, 2.
- 44 See also Ibid., 97, where Bartholin lets nature 'chose' certain paths with the words 'Natura eligit'.
- 45 The metaphor of nature as an artist who produces art is used for instance in 3.76. 'Benignum de Monstris judicium', Bartholin, *Epistolarum centuria III*, 318 and 320. See also Findlen, 'Between Carnival and Lent', 255, and Findlen, 'Jokes', 297. On the relationship between art and nature, see moreover Maria Fabricius Hansen, 'Renæssancens Grotesker', in Ole Høiris and Jens Velløv (eds.), *Renæssancens verden: Tænkning, kulturliv, dagligliv og efterliv* (Århus, 2006), 323–349, 340.
- 46 'Plusculis ab hinc annis in oppido Fioniæ nostræ Affuentztlöff in parochia Ulesloviana prope Neoburgum Matrona quædam Johanna uxor coloni Nicolai Petri parturientis dolores aliquot dies experta, parere non potuit, quanquam binas obstetrices plebejas sibi præsentibus habuerit. Unde tertiam ex vicinia majoris famæ et experientiæ, nomine

Sisseliam, advocavit, quæ magna difficultate tantum tandem promovit, ut onere ventris prægnans levaretur & à morte vindicaretur, sed foetu mortuo sequioris sexus excluso. Dum cadaver hujus ab obstetrice hac & matre puerperæ ablueretur & ad sepulturam præpararetur, mirantur tumidum foetus ventrem, in quo ad tactum videbatur quasi osseum quid delitescere, unde consilio inito, parvo cultello avia aperuit ventrem, & mirum dictu inventus in foetu alius foetus sexus feminini in loco consueto situs, perfectus omnibus membris, circiter spithamam longus, unguibus & pilis donatus ad morem foetus perfecti, & sicut prior foetus ex matre editus vivebat & caro ejus nigricabat, quemadmodum foetus mortui solent; ita hic minor foetus candicabat & carne sana præditus erat, ut ex omnibus indiciis concluderet avia, vitalem fuisse. Ned deerant huic secundæ, quibus in embryonis utero alligabatur'. 6.100. 'Embryo prægnans', Bartholin, *Historiarum centuria V–VI*, 384–385.

47 Ibid., 384.

48 'adeo multa in Naturæ ambitu monstrosa eduntur, seculumque nostrum ferax est rerum à quotidiano usu abhorrentium'. Ibid., 384.

49 'famam aut fortunas'. Bartholin, *De Insolitis*, 98.

50 'quasi illa misella Naturæ ludentis culpam præstare deberet'. Ibid., 98.

51 'Exc. T. qvoque notissima Naturæ Ludibria in Regno vegetabili, ubi dum producitur foetus seu fructus qvorundam Limoniorum, prægnantes illos edit. . . . ubi pomi exigui interioris cortex qvoque flavus, medulla albicans, & succus suis distinctus loculis. Adeo polydædala Natura nunquam otiosa est, sed Curioso Spectatori indies ab Antiquis non percepta proponit miranda rimanda'. 4.62. 'De rubore cancrorum, & Terra solari', From Philipp Jakob Sachs. Thomas Bartholin, *Epistolarum medicinalium centuria IV* (Copenhagen, 1667), 384–385.

52 'Dici non potest, quam ferax sit hoc seculum monstrorum'. 3.84. 'De mirabilibus in partibus humanis', To Gui Patin. Bartholin, *Epistolarum centuria III*, 358.

53 'Nuper donata mihi sunt ossa foetus multa & magna satis, quæ ex umbilico rupto non ita pridem prodierunt post 16. annorum imprægnationem. Vivit adhuc mulier apud nos, & quotannis has ossium crises patitur. Adeò ludit natura circa generationem nostram. Ad umbilicum autem Matris, quæ via ex utero? Simile tamen observarunt quoque Albucasis, Donatus, Cagnatus, Langius. Factum admiramur, vias ignoramus'. Ibid.

54 Cathy McClive and Helen King, 'When Is a Foetus Not a Foetus? Diagnosing False Conceptions in Early Modern France', in Véronique Dasen (ed.), *L'embryon Humain Face Au Temps de L'histoire, Face Au Temps de La Vie* (Paris, 2007), 223–238; Cathy McClive, 'The Hidden Truths of the Belly: The Uncertainties of Pregnancy in Early Modern Europe', *Social History of Medicine* 15 (2002), 209–227; Barbara Duden, 'Zwischen 'Wahrem Wissen' und Prophetie: Konzeptionen des Ungeborenen', in Barbara Duden, Jürgen Schlumbohm and Patrice Veit (eds.), *Geschichte des Ungeborenen: Zur Erfahrungs- und Wissenschaftsgeschichte der Schwangerschaft, 17.–20. Jahrhundert* (Göttingen, 2002), 11–48.

55 3.1. 'Abortus cum Mola'. Thomas Bartholin, *Historiarum anatomicarum rariorum centuria III–IV* (Copenhagen, 1657).

56 'stellam marinam arborescentem'. 3.1. 'Abortus cum Mola'. Thomas Bartholin, *Historiarum centuria III–IV* (Copenhagen, 1657), 3.

57 'cui utrinque ansæ duæ annexæ erant in brachiorum longitudinem ac modum exprorectæ, urticæ marinæ simile'. 3.1. 'Abortus cum Mola', Ibid., 3.

58 3.1. 'Abortus cum Mola', Ibid., 3–4.

59 'modò effigie bufonis cum rictu seu rima oris aperta', 3.1. 'Abortus cum Mola', Ibid., 4.

60 'Molarum quia variæ sunt figuræ, neque unquam sibi similes, casu potius et loci varietate compinguntur', 3.1. 'Abortus cum Mola', Ibid., 3.

61 It does not say directly that the bird had been emitted from a pregnant woman, but it is evident from the context of the rest of the observation.

62 'Familiaris est illa mola in Belgio, ubi vulgò *Suygers* vocatur, quæ sangvisuga, foetui infesta sugillando. Similis illi quam *Levinus Lemnius* describit l. I. de Occult. Nat. Mirac. c. 8. In urbe nostra nonnullæ sunt matronæ, quæ molam talem ediderunt, sedulo caventes

- ne facile innotescat. Post foetum in partu prodit, & cubiculi angulos pervolitando inqvi-
etat mulieres, quæ omni studio persequuntur, ut enecatam comburant, credentes nisi
comprehensa comburatur, laborare aviculam in eo, ut iterum uteri latebras intret, quas si
repetierit, mori puerperam. Observatum quoque aliquando foetus pedem ab hac com-
morsum fuisse in utero'. 1.26. 'Molæ volatiles', Thomas Bartholin (ed.), *Acta medica et
philosophica Hafniensia*, vol. 1 (Copenhagen, 1673), 57.
- 63 1.26. 'Molæ volatiles', Ibid., 57–58. On the genre of *historia* in early modern medi-
cine, see the works by Gianna Pomata, especially Gianna Pomata, 'Praxis Historialis: The
Uses of Historia in Early Modern Medicine', in Gianna Pomata and Nancy G. Siraisi
(eds.), *Historia: Empiricism and Erudition in Early Modern Europe* (Cambridge, MA, 2005),
105–146.
- 64 Alan W. Bates, *Emblematic Monsters: Unnatural Conceptions and Deformed Births in Early
Modern Europe* (Amsterdam, 2005), 126–133.
- 65 See also Ibid., 126.
- 66 'Memini Neapolitanas puerperas frequenter vel ante vel post foetum edidisse carneam
molam, quam feram vocant, suis membranis inclusam. Superstitiosæ de fera ista credunt,
si tangat terram emori puerperam syncope, cui incommodo ut eant obviam, supponunt
semper stragulum, deinde aqvæ immergunt versantque, denique in cloacas abjiciunt'.
1.3. 'Abortus cum Mola', Bartholin, *Historiarum centuria III–IV*, 5. On the fera, see also
Ynez Viola O'Neill, 'Michele Savonarola and the *fera* or blighted twin phenomenon',
Medical History 18 (1974), 222–239.
- 67 Findlen, 'Jokes', 306–307.
- 68 'fructibus in arbore matures . . . vel putrescunt & exsiccantur in arbore relictis, vel decid-
unt & contunduntur'. Bartholin, *De Insolitis*, 9.
- 69 'Corporis humani partes passim in lapidibus, plantis, conchyliis, à Natura effinguntur,
in nonnullis totus homo. Mandragoræ radix homunculum refert, sicut dissecta filicis
radix aqvilam. Juglans cerebri humani gyros, membranas, ventriculos, exprimit, quod
etiam nux moschata obscurius imitatur. Testiculi in satyrione repræsentantur, pulmones
in pulmonaria, renes in asaro'. 3.8. 'Responsio ad foetum mirabilem Mussipontanum', To
Johan Daniel Horst. Bartholin, *Epistolarum centuria III*, 31.
- 70 'Caput infantile, oculis, naso, & ore distinctum propendens puellæ nostræ tumor æmula
specie referebat. . . . Carcinomata quoque inæquali protuberantia diversam faciem ostend-
unt, præsertim exulcerata. Extirpavimus anno superiori ex abdomine feminæ honestæ
carcinoma, capiti infantis haud absimile'. Ibid., 32–33.
- 71 Thomas Bartholin, *Bartholinus Anatomy: Made from the Precepts of His Father, and from the
Observations of all Modern Anatomists; Together with His Own* (London, 1663), 68.
- 72 On the debates on ensoulment in the Renaissance, see Vivian Nutton, 'The Anatomy of
the Soul in Early Renaissance Medicine', in G. R. Dunstan (ed.), *The Human Embryo:
Aristotle and the Arabic and European Traditions* (Exeter, 1990), 136–157.
- 73 Ann Blair, *The Theater of Nature: Jean Bodin and Renaissance Science* (Princeton, 1997), 26.
Blair relates this position to what Daston and Park have termed the prodigy complex.
However, it can still explain the implicit aims of Bartholin's more naturalistic framework.
- 74 Ibid., 95.
- 75 Ibid., 95–97.

9 Three seventeenth-century manuals on how and where to study medicine

Ole Peter Grell

Between 1628 and 1674, no less than three books on how and where to study medicine were published by prominent Danish physicians. They were presumably in the first instance aimed at Danish medical students, but most likely also hoped to cash in on the growing northern European market for such books. All of them may well have been inspired by the new methodological literature about how to undertake educational travel which had been published from the late 1570s, even if only the last of the Danish manuals explicitly acknowledged its debt to one of these books, namely Theodor Zwinger's *Methodus Apodemica* (1577).¹ It is noteworthy that nearly all the authors of these methodological tracts were Protestants. However, bearing in mind that most of the students undertaking the *perigrinatio academica* were from Protestant northern Europe heading for the Catholic south that can hardly be a surprise and may not have any confessional significance.²

These three books were the first manuals for the study of medicine to be written and published by Danish physicians, and they were evidently written because their authors considered medical education of considerable importance. The three books shared one major assumption, namely that medical travel was essential in order to achieve the best medical education and that medical students therefore should seek out the best places and teachers for their studies.

For Danish medical students the need to travel was paramount. The medical faculty of the University of Copenhagen which had reopened in 1537 as a Lutheran seat of learning modelled on the Melanchthonian University of Wittenberg had been off to a slow start. Initially it only managed to employ one professor of medicine until finally in 1571 a second professor was recruited. To receive a comprehensive medical education Danish medical students needed to go abroad well into the seventeenth century, which they did in increasing numbers until 1660.³

Bearing in mind that the great majority of these students were brought up and educated in a Lutheran country during the age of confessionalisation, when religious positions were hardening and any suspicion of religious heterodoxy might prove detrimental to both career and livelihood, it is noteworthy that only five out of a total of seventy-two MDs before 1660 were obtained from a Lutheran university, namely the University of Copenhagen, and at a late date

when the faculty of medicine had finally begun to flourish. The fact that none of the German, Lutheran universities, such as Rostock, Wittenberg or Helmstedt possessed internationally renowned medical faculties during this period, undoubtedly played their part in this.

Instead, the majority of Danish medical students obtained their MDs from the Reformed University of Basle – twenty in total. Clearly, this was a trend started by the first professor of medicine at the University of Copenhagen after the Reformation, Christen Torkelsen Morsing, and sustained by the golden years of the medical faculty at the University of Basle during the late sixteenth century and early years of the seventeenth century, which corresponds with the period when 75 per cent of the MDs were awarded to Danes. MDs from Basle retained their value to Danish medical students for some years after the golden period, when leading medical lights such as Caspar Bauhin, and Theodore and Jacob Zwinger had taught at the University. The fact that the University of Basle was a Reformed/Calvinist seat of learning would appear to have mattered little.

Fifteen students obtained their MDs from Padua, the majority awarded in the decade between 1650 and 1660. Since 1540 when Andreas Vesalius had taught anatomy there, the medical faculty of the University of Padua had proved a magnet for foreign students irrespective of their religious views, while the city state of Venice had done its best to accommodate non-Catholic students. Evidently Danish medical students had little or no concern about possible religious repercussions when they returned home with an MD from Padua. They may also have been encouraged to extend their medical studies in Padua by the presence there from 1622 to 1659 of the learned Danish physician Johan Rhodius. Rhodius was close to both Caspar Bartholin and Ole Worm in Copenhagen and often provided lodging for Danish students studying in Padua.

However, the significance of Basle and Padua for Danish medicine and physicians should not be overstated. The fact that only four students got their MD from the University of Leiden plus another six from other universities in the Dutch Republic does not signify that these places were not highly rated among Danish medical students and their teachers in Copenhagen. In fact, more than half of all the medical students who studied abroad matriculated at the University of Leiden often for extensive periods. That only four of the sixty-five students obtained their MD from Leiden may well have been due to the significantly higher cost of an MD there.⁴

One might therefore conclude that religion or more specifically the Lutheran faith of these medical students mattered little when it came to their medical education and qualifications. Bearing in mind the now well established association between religion and medicine in this period, this is somewhat surprising. Did confessional differences not matter to these medical students and their teachers at the University of Copenhagen? The three manuals for the study of medicine provide fairly detailed instructions about the subjects medical students should study, what books to read, and what practical experience to acquire. But what advice if any did they offer on confessional issues?

The first manual for the study of medicine was published by Caspar Bartholin (1585–1629) who had become professor of medicine at the University of Copenhagen in 1613, but moved on to a professorship in theology in 1624. His *De Studio Medico*, written in 1626, but published two years later in 1628, proved popular and went through numerous editions well into the second half of the seventeenth century.

The second manual to be published was Johan Rhodius' (1587–1659), *Three Recommendations for the Education in the Art of Medicine until Now Only Communicated to His Close Friends*, which was published by Thomas Bartholin in his *Cista Medica Hafniensis*, Copenhagen 1662. This work had clearly circulated in manuscript among Rhodius's friends and associates before it was posthumously published by Bartholin. Rhodius had been based in Padua since 1622 when he matriculated in medicine. He became a highly esteemed member of the republic of letters, but never held any public office or teaching position. He would appear to have tutored a number of Danish medical students who stayed with him while they matriculated at the University of Padua.

The third guide to medical study and travel was published by Caspar Bartholin's son, Thomas Bartholin (1616–1680), who became professor of anatomy at the University of Copenhagen in 1649. Bartholin published his *De Peregrinatione Medica* in 1674, having by then already retired from any direct involvement with the University of Copenhagen. Like his father's manual from 1628, it proved popular and went through a number of editions across northern Europe. The prominent professor of medicine and reformer of public health, Johann Peter Frank (1745–1821) recommended it to an academic audience as late as 1792.⁵

These three manuals provide us with an idea of whether or not the study of medicine changed during the seventeenth century and about what was required of a good physician in terms of both natural philosophy and religion.

The author of the first manual, Caspar Bartholin the Elder, had already published a highly successful anatomical textbook for students in 1611, *Anatomicae Institutiones* – the basics of anatomy – which was continuously reprinted across Europe during the first half of the seventeenth century. Here he pointed out in his introduction that he had personally benefitted greatly from his own *peregrinatio medica*, gaining considerable medical knowledge, even if it had come 'at great expense, by continual application, and with frequent peril to his life'.⁶ Caspar had started his studies abroad as a theology student in Wittenberg in 1603, an obvious choice when it is borne in mind that his father was a Lutheran minister. In the spring of 1606, Caspar visited a number of universities and academies in Germany before spending the summer in the United Provinces, where the medical faculty in Leiden proved of particular interest. Despite spending less than a month in Leiden, Caspar Bartholin still managed to get virtually all the famous professors at the University to sign his *album amicorum*. The Leiden stay appears to have inspired Caspar to change from theology to medicine and go to Basle in order to benefit from the renowned teaching at the medical school by leading figures such as Jacob Zwinger, Felix Platter and Caspar Bauhin. Basle attracted Caspar Bartholin with its practical and empirical

approach to medicine, especially in the fields of anatomy and botany, but also its Paracelsian, alchemical medicine, which had characterised the University since the days of Theodor Zwinger. And then, of course, there were the long-standing ties between the University of Copenhagen and the medical faculty in Basle. For a Danish physician, it was an important place to have studied. Before Caspar obtained his MD in Basle in 1610 under the supervision of Caspar Bauhin, he spent some time in Padua, where he had matriculated in 1608, practising human dissections. Caspar appears to have travelled widely in Italy and France over the next couple of years and claimed to have been offered chairs in medicine in both Catholic Naples and at the Calvinist academy in Sedan before returning to Copenhagen in 1611 where he was given the vacant Chair in pedagogy, only to be promoted to a Chair in medicine in 1614.⁷

When Caspar Bartholin wrote his guide in 1626, *De Studio Medico* (1628), he had already exchanged his chair in medicine for one in theology. The manual was dedicated in the first instance to his orphaned nephew, Peder Charisius, for whom Caspar served as a guardian and who had a couple of years earlier begun his medical studies at the University of Rostock, and second to Caspar's six sons who were only toddlers in 1626. It was intended to provide advice on how to study medicine in a way which Caspar claimed would 'prove useful for the dedicated future physician who wanted to distinguish himself from the vulgar'. The fact that Charisius was the grandson of the famous physician and Paracelsian, Peter Severinus the Dane was emphasised as was the international fame of Severinus as both physician and alchemist (spagyrist).

After having referred to his own excellent credentials, as a physician Bartholin informs, his readers that stylistic elegance was not his concern, only a comprehensive account. Significantly, rather than moving straight onto the study of medicine itself, Caspar Bartholin uses the next few pages to emphasise the importance of Christian piety for the successful physician. Expanding on The Book of Psalms (127, 1) Bartholin stated that 'without piety all work, every journey, all efforts, every enterprise, every study, all diligence, will fail'.⁸ Caspar Bartholin was convinced that only medicine based on Protestant piety and practiced by a godly physician would be effective. As he put it:

Some people seem to themselves perhaps to want to or be able to undertake the study of medicine without piety, after the fashion of Heathens and Jews. But either success lasts only for a while as the love of vice stains everything in the mind and in the hand, or creates a dangerous melancholy. And for those who do not suffer from this disease, their consciences generate anxiety and worry either when they treat dangerous cases, or if their treatment fails. Prayers and consolations in accordance with the Word of God most powerfully dispel all these things. Therefore, anyone who is a student of this art will count it as a gain every single morning after prayers, to read one or two chapters from Holy Scripture, not superficially but carefully and reflectively; and in such a way that each and every year he runs through the whole Bible and completes it.⁹

Faith and an active, godly life was what was the basis for the medicine of the good, Protestant physician. Only through the continuous study of the Bible could the physician obtain faith and lead a pious life. This was the platform needed for the physician to comprehend God's Creation – the Book of Nature – without which all medicine would be in vain. Caspar Bartholin therefore offered the following advice for medical students:

First and foremost, therefore, I commend to you piety, an unblemished life, daily prayers, love of the Word of God and heed for it: If God is not present and pours strength into herbs, what use, I ask, is dittany and panacea?¹⁰

Caspar Bartholin certainly practiced what he taught, and presided over a pious household. Every day, his family gathered to sing psalms and listen to Caspar read a chapter from the Bible, while emphasising their Christian obligation to lead an active and godly life, and when public commitments prevented him from doing so, his wife replaced him.¹¹

The study of nature, according to Caspar could only be successfully undertaken with God's assistance (Psalm 127, 1). Citing 1 Corinthians 2, 14–16, Caspar emphasised that carnal Man cannot achieve a proper understanding of medicine and the Creation, that is only achievable by the spiritual and Godly Man.¹²

De Studio Medico is a compact manual of only fourteen pages in quarto, and it is noteworthy that Caspar Bartholin dedicated no less than four pages to issues of faith and piety, more than 25 per cent of the whole manual. Bartholin, the Lutheran theologian and professor of theology looms large in this manual. When Bartholin finally came to the study of medicine, he informed the reader that students cannot jump straight into the subject of medicine, but first they need to acquire an 'exact and profound knowledge of Latin and Greek, because the foundations of medicine are put forward in these languages'.¹³ By that Caspar Bartholin not only meant Hippocrates and Galen, but also contemporary scholars such as Jean Fernel and Jan van Heurne. Students were advised to consult the original texts. Bartholin emphasised that the Arabic authors, such as Avicenna and Rhazes had taken most of their valuable information from the Greeks, but in the process missed even more significant material. Like in his manual for the study of theology, *De Studio Theologico*, which he also published in 1628, Bartholin advised his medical students to consult the proper sources. Where students of theology were told to abandon theological commentaries and instead focus on the study of Scripture alone, medical students were recommended to return to the texts of Hippocrates and Galen.

Bartholin then proceeded to refer to twenty-six different subjects which were of greater or lesser importance for the medical student. In the process, he referred to no less than a hundred authorities/authors including himself and in many cases to specific publications. Bartholin began with the trivium and quadrivium subjects relevant to the study of medicine before tackling the different medical subjects.

Close to three-quarters of the works which Caspar Bartholin referred his students to were published in Germany, France, and Italy. Their authors were fairly evenly split between Catholics and Protestants, and among the Protestants Lutherans dominated even if the number of Reformed authors was considerable. In other words, no confessional preference can be detected in Caspar Bartholin's choice. More significant is the fact that apart from a few classical and medieval authors all the authorities Caspar wanted his students to consult were 'modern' having published their work in the sixteenth and seventeenth centuries – no less than 81 per cent can be defined as his contemporaries.¹⁴

Most of *De Studio Medico* reads like a guide to what to study and through whose works. Rhetoric and logic are important, and Bartholin referred to his own works in these fields published only the previous year. Practical philosophy was, however, of little importance to medical students, whereas metaphysics was of considerable significance, as was natural philosophy; as Bartholin put it: 'Where the natural philosopher stops there the physician starts'.¹⁵ Mathematics and arithmetic were likewise important to the physician so he could calculate the 'critical days', and analyse how drugs were put together. Some basic knowledge of geometry was also useful, but not too detailed, because the future physician has to 'consider all of Nature'. Knowledge of optics was important, but not as essential as astronomy. For the latter, Bartholin recommended the works of Tycho Brahe and Kepler, but in particular his brother-in-law, Longomontanus, and his recently published work, *Astronomica Danica* (1622).

Similarly, astrology was of the greatest importance for those aspiring to become physicians. Here Bartholin provided the longest list of recommended authors, starting with Marsilio Ficino, but showing a telling preference for those originating within the Melanchthonian tradition of natural philosophy. Johannes Stöffler, Melanchthon's teacher, and astrologer and mathematician in Tübingen was mentioned, as was Johannes Hasfurt who was court astrologer in the Palatinate and who had provided Melanchthon's horoscope and a commentary for Melanchthon's publication about the conjunction in 1524. Finally, the last of Bartholin's recommended astrologers was Melanchthon's son-in-law Caspar Peucer, who as professor in Wittenberg had carried on the Melanchthonian tradition in both natural philosophy and theology.¹⁶

After detailed references about what to read about minerals, metals and stones, about botany and natural history, more particularly zoology, all subjects important to the student of medicine, Caspar Bartholin underlined the importance of anatomy for the medical student. He mentioned the works of Andreas Vesalius and Jean Riolan and a number of past and present professors at Padua, such as Colombo and Aquapendente, but in particular he emphasised how important it was to take part in 'private dissections of animals and their body parts, while simultaneously, as often as possible, to attend all public dissections of human bodies', emphasising the importance of observation and experience.¹⁷ Bartholin then briefly referred to the importance of medical theory (*medica ipsa arte*), medical controversies, diets and cures recommending a number of experts and their works.

It is only towards the end of his book, when dealing with surgery, that it becomes clear that Caspar Bartholin also expected medical students to travel in order to facilitate their studies. For surgery he recommended among others Vesalius, Aquapendente and Felix Weyer as the best teachers, but then adds: 'Do not refrain practicing this craft in Italy and France where you will find some of the best surgeons in Europe, and through daily practice notice the important things which are unknown to the common dabbler or barber'.¹⁸ Similarly, the medical student was advised to study pharmacology carefully and to get directly involved in the preparation of drugs. Alchemy was also highlighted as an important subject for the student of medicine and the works of Joseph du Chesne, Andreas Libavius and Oswald Croll among others were recommended, but students were told to look as widely as possible for alchemical arcana on their travels, because many can be found among the learned and at the courts of princes. Bartholin especially mentioned the remedies of Tycho Brahe and Peter Severinus, the Dane, while also mentioning the only Englishman to be referred to in his manual, John Bannister.

In this somewhat longer section, Bartholin takes the opportunity to advice Peter Charisius to look for the arcana which his grandfather Peter Severinus might have left behind in his book cupboards. He directs his own sons to his own alchemical library where they will find many volumes which he has collected during his European *peregrinatio medico* and which contain rare arcana. Despite the fact that he is aware of the reservations with which such remedies are held by many medical men, Bartholin was adamant that the medical student 'must always pursue alchemy with its charcoal and glass flasks: otherwise your work will have been in vain'.¹⁹

The last page of *De Studio Medico* is dedicated to the importance of medical travel. Referring to Galen who claimed that it is necessary for the good physician to travel because he is at the same time a natural philosopher: 'Not every place can provide nourishment for everything, be it minerals, plants or creatures. Likewise neither are all the best physicians gathered in one area or country'. Providing a number of examples of where certain subjects were best taught Bartholin concluded that 'only fools and simpletons can fail to understand the significance of foreign travel to the medical doctor in the making'.²⁰

It is difficult to determine how much impact a guide like this had on medical students or even on those of Caspar Bartholin's sons who studied medicine. However, some indications can be found in the letters his son Erasmus exchanged with his uncle and guardian in Copenhagen, Ole Worm.

Erasmus Bartholin, born in 1625 and one year old when *De Studio Medico* was written, set out on his foreign travels in 1646, having first studied for a few years at the University of Copenhagen. He spent the next decade travelling and studying abroad, only interrupted by a brief visit back home obtaining his BA. Erasmus matriculated at the University of Leiden during the summer of 1646. Despite the encouragement of his brother Thomas to focus exclusively on medicine, he found it impossible to give up mathematics and seemed to have studied both. He did, however, find it difficult to find a good tutor – reporting

back to his uncle and mentor, Ole Worm, in Copenhagen, 'that there was nothing they feared more here (Leiden) than to take on too much work'.²¹

Writing to his uncle a year later, Erasmus offered a detailed report on his recent trip to England, in particular his visit to John Tradescant's museum in London and the botanical garden in Oxford. The letter also reveals his growing fascination with the philosophy and mathematics of René Descartes – 'this phoenix among mathematicians' as he puts it – plus an awareness of recent scholarly developments such as the planned Elsevier edition of the collected works of Johannes Baptista van Helmont (*Ortus Medicinae*) and a Le Maire edition of authors who have written for and against the circulation of the blood.²² Even if Cartesianism and mathematics loomed ever larger among Erasmus's interests, he still remained committed to medicine by spring 1648, reporting on Johannes Walæus's recent appointment to a chair in medicine at Leiden and Walæus's plans for taking his students to the local hospital for bedside teaching, while he himself followed the lectures by Vorstius on the aphorisms of Hippocrates.²³ However, by September that year, Erasmus's preference for mathematics was evident when his uncle and recently returned brother Thomas tried to make sure that he was awarded a scholarship in mathematics from the University in Copenhagen.²⁴ By the autumn of 1649, medicine had become a subsidiary interest for Erasmus who had by then befriended the Leiden professor of mathematics, the Cartesian Frans van Schooten, with whom he had recently been touring the Netherlands inspecting fortifications and discussing geometry with leading Jesuit/ Catholic scholars in Gent and Louvain. By now a disciple of Descartes, Erasmus Bartholin was invited by Descartes to publish comments he had recently produced on Descartes's geometry added to the new Latin translation of Descartes' work published by Le Maire with further comments by Van Schooten.²⁵

Erasmus still found time to take an interest in medicine, reporting back to his uncle in Copenhagen that he was fascinated by the anatomical undertakings of Adrian Valckenburg. Erasmus was involved in Valckenburg's dissection of a young man of sixteen who had died in the local hospital, having suffocated from an epileptic fit. He informed Ole Worm that they had been unable to discover any clear cause of death – except that the cerebral ventricles were seriously compressed, a fact which would have been easy to miss, if Adrian Valckenburg had not carefully sliced the brain away bit-by-bit.²⁶

During his last year in Leiden, Erasmus Bartholin's reputation must have been considerable since he was entrusted with editing Van Schooten's lectures on the mathematics of Descartes to which was added one of Erasmus's own essays (1651). He had also found time to translate into Danish some of the works of Euclid and Archimedes about the foundation of mathematics, which he hoped to publish for the benefit of his fellow Danes who did not have the benefit of such translations.²⁷ Erasmus then spent the next couple of years in France where he befriended another talented mathematician, De Baune, whose lecture notes he collected after De Baune's death and turned into a volume which he published in 1659.

Erasmus subsequently matriculated in Padua where he obtained his MD in 1654, before returning home in late 1656 via France, Basle and England. He was given the chair in mathematics at the University of Copenhagen, but quickly moved on to the third chair in medicine in August 1657, while continuing to lecture on mathematics. He was made Royal mathematician in 1667. In 1671 he was awarded the first chair in medicine, which he was allowed to retain even after he was excused all teaching by Royal decree in 1678. Having shown his interest in astronomy in 1664–65 with his observation on the great comet he was given the task by King Frederik III to publish Tycho Brahe's observations based on the MSS recently acquired by the Crown from the relations of Kepler – a project which eventually came to nothing due to the financial constraints of the Crown. Erasmus eventually ended his career within the Royal administration

It was, however, his discovery of the double refraction of light in Icelandic crystal which secured Erasmus's fame, where he observed how light penetrated the crystal and split in two, only one of which followed Descartes' law on refraction.

There is no evidence of the Lutheran piety which was so prominent in his father's writings in Erasmus letters. Of the twenty-six subjects of importance to the student of medicine emphasised in *De Studio Medico*, it would appear that Erasmus ignored most of them, while focussing on one subject – mathematics – which had only been among the less significant of his father's subjects. Erasmus ignored three of the four most important subjects (astrology, botany, anatomy, surgery) only demonstrating an interest in anatomy. Time had probably run out for a manual like *De Studio Medico* by the mid seventeenth century – its Melanchthonian natural philosophy might well have struck a Cartesian like Erasmus Bartholin as old fashioned by then. Caspar Bartholin's manual was, however, reprinted by his son Thomas Bartholin in his *Cista medica Hafniensis* published in Copenhagen in 1662, and more surprisingly as an addition to Hermann Conring's, *Introductio in artem medicam*, published in Helmstedt in 1687.²⁸ By 1687 the advice in *De Studio Medico* on how and where to study medicine would have been seriously dated. Perhaps it was its emphasis on Lutheran piety which attracted Conring, himself a Lutheran, first educated at the Lutheran University of Helmstedt and later employed there as a professor of medicine. Similarly, Hermann Conring might also as a latter-day polyhistor have been attracted to Caspar Bartholin's polyhistorical approach to medicine and decided to add it to his own introduction to the study of medicine.

Johan Rhodius's *Three Recommendations for the Education in the Art of Medicine until Now Only Communicated to His Close Friends*, which Thomas Bartholin published in his *Cista Medica Hafniensis* in 1662, three years after Rhodius's death, might well have circulated in manuscript for a decade before it was published. A number of Danish medical students who boarded with Rhodius while in Padua, including Thomas Bartholin himself may well have been familiar with it. Rhodius, a wealthy bachelor who practiced as a physician and held a special

interest in medical philology, was a highly esteemed medical man and teacher. In 1631, he turned down the chair in botany at the University of Padua and later declined chairs in natural philosophy at the University of Copenhagen and medicine at the noble Academy in Sorø. In 1649, he declined a Royal invitation to return to Copenhagen.

Rhodius's manual differs from Caspar Bartholin's by making no references to religion at all. One wonders whether this was a consequence of Rhodius having settled in Catholic but tolerant Padua. Rhodius had been brought up as a Lutheran, but had no problems in studying and graduating from the University of Padua. He never converted to Catholicism and appears to have taken no interest in religious issues. Rhodius's manual bears some similarities to Caspar Bartholin's in its many references to medical authorities and books. Of the 58 works referred to and recommended to students 22 were also cited by Caspar Bartholin in *De Studio Medico*. Most of the other works were later publications such as Johan Vesling's *Syntagma Anatomicum, publicis dissectionibus, in auditorium usum, diligenter aptatum*, a popular anatomical textbook based on his dissections in Padua published in 1641 and Johannes Jonston, *Idea universæ medicinæ practicæ*, Amsterdam 1644, to mention just a couple.

Rhodius's manual is divided into three sections. It starts with two shorter sections titled 'The very brief shortcut to medical education'. They are focussed narrowly on medical topics with advice on what to study and who to read. Rhodius, however, constantly instructs his readers to supplement their readings of such works with practical experiences and observations. They are advised to take part in dissections and to attend anatomical demonstrations, especially those conducted by surgeons (*in Collegium Chirurgicum*). The aspiring physician is advised to follow an experienced physician in his daily work and learn from him rather than from books on medicine, because, as Rhodius puts it, one can always read but not always be present at an instructive lecture or treatment. Repeatedly Rhodius refers his readers to the works of Daniel Sennert, the Wittenberg professor of medicine, especially his *Epitome institutionum medicarum* published in Wittenberg in 1631 and 1634 and his *Medicinae practicae* in six books published in Wittenberg from 1628 to 1635.

Rhodius concludes his manual with a longer section titled 'A more detailed instruction about medicine'. Here he divides the study of medicine into a six-year programme. In his first year, the medical student is advised to study some of the broader works about medicine such as Daniel Sennert's *Epitome institutionum medicarum*, and then to focus on botany and anatomy, while taking the opportunity to take part in dissections. Rhodius recommends his students spend two years in either Germany or Holland focussing on this. They are then to go to Montpellier and make themselves aware of medical controversies, while simultaneously finding the time to acquaint themselves with drugs – *materia medica* – by visiting an apothecary. If possible they would be well advised to learn how to work with chemical drugs. After a year in Montpellier, the medical student is advised to travel to Padua to acquaint himself with diseases and once again he is advised to start by reading Daniel Sennert's

work on practical medicine. In Padua, he should focus on clinical teaching and lectures given by the leading clinicians, but most of all students should accompany these physicians during their consultations. Rhodius instructs medical students to take copious notes from these consultations; in fact, students are advised to spend all their time during their fifth year of study by following the work and consultations of a famous medical teacher. Rhodius is convinced that if medical students dedicate themselves fully to this task, they will have little or no time for studying during that year. Again and again Rhodius emphasises the importance of taking notes systematically. All the patients seen should be listed by the students and divided into natural, unnatural and supernatural cases with all the treatments offered, in order that an understanding of their effectiveness could be established. After five years of medical study, students were, according to university regulations, ready to practice as physicians, but Rhodius advises them to continue their studies for a sixth year for their own and their patients' sake by returning to some of the works he had recommended them to study in their third year, but this time they should take detailed and systematic notes of their contents.²⁹

Johan Rhodius's manual is innovative in the way it organises medical study around what and where to study over a period of six years rather than the university prescribed five years. It differs from Caspar Bartholin's manual published a generation earlier by its total omission of any religious considerations and its lack of references to medical astrology and iatrochemistry and Paracelsian remedies. Where Caspar Bartholin was a polyhistor in his approach to medicine, Johan Rhodius was far more narrowly focussed on subjects directly relevant to medicine. Furthermore, the importance attached by Rhodius to practical experience and personal observation for the study of medicine is even more pronounced than in Bartholin's *De Studio Medico*.

When Erasmus's brother Thomas Bartholin (1616–1680) published his *De Peregrinatione Medica* in 1674, it was dedicated to his two sons Caspar and Christopher and his nephew, Holger Jacobsen, who were just about to begin their medical studies abroad. It proved a very different guide to both his father's and Johan Rhodius's. It was much longer, seventy-three quarto pages, and was much more of a travel guide than a guide to how to study medicine. It also referred to far fewer medical authorities and texts than his two predecessors. Instead, it drew to a much larger extent on the author's personal experience.³⁰

Thomas Bartholin had started his university studies at the University of Copenhagen in 1634 and, like his father, initially intended to study theology until he opted for medicine in 1638. He began his travels in 1637, first spending three years in Leiden where he became close to the anatomist Johannes Walæus. By May 1638, his uncle and mentor Ole Worm concluded that Thomas had finally decided to abandon theology for the study of medicine. As opposed to Thomas' mother, Ole Worm not surprisingly approved of Thomas' decision to study medicine. Thomas claimed that he had been attracted to medicine by seeing the miserable existence of the considerable number of refugees in Leiden 'who robbed of all the gifts of fortune had been forced to flee their Fatherland'.

These refugees having fled the effects of the Thirty Years' War in Germany had taught him that 'the effects of a fickle fate had to be forestalled though the type of studies which protected its devotee from the injustice of fate'.³¹

Thomas Bartholin took an early interest in the anatomical discoveries of Gasparo Aselli and William Harvey, the so-called *lacteals* (milky veins) and the circulation of the blood. In Leiden, he also edited a new, improved and illustrated, edition of his father's anatomical textbook from 1611, which was published in 1641. Despite the fact that his additions to his father's work were rather insignificant and the illustrations were borrowed from other works, the edition proved important because he was able to include new discoveries about the brain by his Dutch contemporary Franciscus de la Boë Sylvius and two letters about the circulation of the blood and the lacteals by Johannes Walæus. It became the first anatomical textbook to acknowledge Harvey's discoveries. Thomas then continued his *peregrinatio* arriving in Paris in 1640 and in Montpellier the following year, leaving for Padua later that year. While in Padua he started to have doubts about his commitment to medicine, but was encouraged by his mentor and uncle, Ole Worm, to stick with the subject. He obtained his MD in Basle in 1645 and returned to Copenhagen in 1647 after having spent the previous year in the United Provinces. He was initially awarded the professorship in mathematics, but was made professor of anatomy the following year and made a success of the newly opened *Domus Anatomica* in Copenhagen. As an anatomist he discovered the lymphatic system in humans. He, however, disliked medical practice and avoided it as much as possible. He stopped his dissections in 1656 and four years later was relieved of his teaching duties as professor of medicine while retaining both his title and his salary.

His *De Peregrinatione Medica – On Medical Travel* – puts the emphasis on travel – as Thomas Bartholin stated: 'carefully planned journeys contribute to our understanding of the thought and knowledge of the sages'. Thomas Bartholin recognised that travel had become endemic by the late seventeenth century, pointing out that 'it seems that the whole of Europe is on the move'.³² Travel for its own sake was in his opinion not desirable. The journey must have a goal otherwise the traveller will not be able to achieve anything or 'increase the body of useful knowledge'.³³ For no one was that more important than the medical student, as the example of Hippocrates demonstrated. Bartholin had no doubt that 'such great usefulness redounds to the physician from his travels that no one puts much faith in the authority of a physician who has not set foot outside his native land'.³⁴

First of all, the travelling medical student must acquire practical experience of how to treat patients by visiting some of the major hospitals to experience at first hand how local physicians were dealing with their patients, taking the opportunity to discuss their cases with them. Similarly visits must be made to laboratories, to the workshops of chemists and to pharmacies to get direct and practical experience of how drugs were made. The emphasis is on practical experience and observation as it was in Johannes Rhodius's manual.

Second, Bartholin advised his students to study anatomy on their journeys. Famous anatomists were, according to him, now present in most of the major European cities and furthermore many of them were his personal friends. They were all keen to attract foreign medical students. A list of around fifty leading medical men from across Europe was provided. As opposed to Caspar Bartholin's list of medical authorities, produced fifty years earlier, and that of Rhodius from around the middle of the century, Thomas's list included a number of English scholars, such as Harvey, Glisson, Willis, Highmore and Lower, thus announcing the arrival of English medicine on the European stage.

Despite his praise for practical anatomy and the importance he attached to it, Thomas Bartholin could not hide his reservations. He concluded that almost everywhere anatomists had been 'victims of misfortune', injuring themselves with the knife, or if they had avoided that, they had been 'debilitated by the stench of the cadavers so that few can hope to reach a venerable age'.³⁵ One wonders whether this was the reason why Bartholin had halted his dissections eighteen years earlier. The lack of financial reward would undoubtedly have been a contributory factor, as he himself acknowledged when completing his section on anatomy by pointing out that even if the anatomist 'complete the journey and grow old at home with Galen', he will have nothing to show for it 'except wearied and bloody hands'.³⁶

For the travelling medical student, people were more important than places; quoting Plato, Bartholin pointed out that inspiring teachers were 'guides to lasting happiness', even if not all what was taught ought to be uncritically accepted.³⁷ Students should remain focussed on what to learn, prioritising knowledge 'which look to the purpose of medicine, the health of the ailing and matters of truth'.

Bartholin then warned his students against becoming polyhistorians, telling them to 'disregard the rubbish with which they exhaust themselves'; instead they should focus on medicine especially its practical aspects. For as he pointed out:

we see that some mediocre in learning but bold and experienced in treatment have triumphed over those of greater learning so that material success has blessed the one while others are scarcely able to keep in salt.³⁸

This attack on the polyhistor sat rather oddly with Thomas Bartholin's personal experience and education, which he went on to describe in detail. Bartholin had studied Hebrew, Aramaic and Coptic, followed lectures on law, and taken an interest in poetry as well as antiquarianism. He explained that he did not regret having spent so much time acquiring knowledge of 'no lucrative value', as he described it, and concluded that 'a pure physician is commonly called a pure ass'. Evidently knowledge outside medicine served to improve not only the physician's bedside manner, but also his social standing. Bartholin therefore recommended his students to devote their spare time to the study of philology and antiquity in order to render themselves 'agreeable and cultivated', rather than spending their time on 'games, unseemly lovemaking, drinking parties, gambling and adornment'.³⁹

Finally, Bartholin referred his readers to Theodor Zwinger's *Art of Travel* (*Methodus Apodemica*, 1577), even if he considered the book more useful to the teacher and general traveller than the journeying physician. Bartholin would have liked Zwinger to have found time to complete his work with a volume specifically dedicated to what medical students ought to observe and study while travelling, adding that he himself had at some point contemplated writing such a work, 'a kind of medical itinerary' as he labelled it, which eventually other duties had prevented.⁴⁰ This reference to Zwinger's work, which offered readers systematic outlines and questionnaires to guide their travel experience and which was heavily influenced by the traveller and polyhistor Hugo Blotius, would appear like Bartholin's own studies to be at odds with his rejection of the activities of the polyhistor.⁴¹

Only one of Thomas Bartholin's two sons, Caspar Bartholin the Younger (1655–1738) eventually studied medicine. Together with his younger brother Christopher, the nineteen-year-old Caspar set out from Copenhagen in 1674 having just been made professor of philosophy at the university. After three years studying medicine in the Netherlands, France and Italy during which time he published several minor works on both medicine and classical archaeology, he returned home. Like his father, he made an anatomical discovery, namely the so-called Bartholin gland, while performing dissections in Paris.

Upon his return in 1677, Caspar the Younger was first awarded the chair in natural philosophy and having obtained his MD in 1678 from the University of Copenhagen, he was promoted to a professorship in medicine. In 1690, he left academia and became a High Court Judge and finally Procurator General in 1719, joining his brother Christopher within the expanding Royal administration. These positions undoubtedly offered considerably better financial rewards than university chairs, and would indicate that if nothing else they had taken on board their father's concern for money. However, if Thomas Bartholin, when dedicating his *De Peregrinatione Medica* to his sons, had hoped to encourage them to focus primarily on the study of medicine, he would appear to have failed, with only Caspar briefly pursuing a medical career at the University of Copenhagen.

Conclusion

From the three manuals discussed here the world of medical travel and education would appear to have changed dramatically in the fifty years between their publications. The role and significance of Lutheran piety which had featured so prominently in Caspar Bartholin the Elder's manual from 1626 hardly made an appearance in Rhodius's or his son Thomas's manuals. Only towards the end of Thomas's travel guide do we find a reference to the role of religion. In a short paragraph, briefly acknowledging his Melanchthonian roots, Thomas Bartholin stated:

That we may achieve greater perfection virtue warns us to detest falsehood and to pursue truth; and especially does this concern the piety which ought to be preserved toward God lest intent on nature we lose the author

of nature, lest in caring for the health of the body we destroy the health of the soul.⁴²

Where Caspar Bartholin's and Johan Rhodius's manuals read like study guides, Thomas's reads like a travel guide. The first two are packed with references to works which ought to be consulted, Thomas's to people to be approached and places to be visited.

All three manuals emphasise the importance of the study of anatomy and the significance of medical travel for the practical experience of anatomical dissections, but only Thomas Bartholin warned about the dangers inherent in anatomical practice, that is the dangers of accidental cuts to the limbs of the anatomist, which could result in infections, not to mention the stench of the corpses to be dissected, which he considered a long-term health risk.

On another couple of points, *De Peregrinatione Medica* differs significantly from the other two manuals, namely in its concern for remuneration and its rejection of the polyhistor. Caspar Bartholin and Johannes Rhodius do not refer to pay at all in their manuals, while Thomas returned to it twice. First in connection with anatomy which he claimed would do little to improve the physicians' income and later in connection with his rejection of the polyhistor, where he concluded that learning matters little when it comes to establishing a successful practice – here the practitioner who can produce the best treatment will always win out.

Medical astrology had been an important subject for the medical student to study in Caspar Bartholin's *De Studio Medico*, and he pointed his students to no less than eighteen different authors worth consulting, among them Marsilio Ficino and the already mentioned Melanchthon-inspired German astrologers. Caspar Bartholin was a forceful promotor of Melanchthon's view of astrology. Like Melanchthon, Bartholin saw the stars as influencing all of nature, the body, its organs and through them the soul, because, as he argued, 'when the body is healthy the soul fares well'.⁴³ To judge from the two later manuals by Johan Rhodius and Thomas Bartholin, medical astrology had lost its significance by the middle of the seventeenth century; neither author makes any reference to it.

Furthermore, even if Thomas Bartholin's own experience would seem to contradict his advice in *De Peregrinatione Medica*, his emphasis on the importance of medical knowledge and practice over any other knowledge for the physician signals that the age of the physician as polyhistor or polymath, which had been so characteristic of the late sixteenth and early seventeenth centuries had come to an end.

Notes

1 For the methodising of travel in the sixteenth century, see J. Stagel, *A History of Curiosity. The Theory of Travel 1550–1800* (London, 2004), 47–94.

2 Ibid., 64–66, 75–76.

3 See O. P. Grell, 'Caspar Bartholin and the Education of the Pious Physician', in O. P. Grell and A. Cunningham (eds.), *Medicine and the Reformation* (London, 1993), 78–100, and O.

- P. Grell, “‘Like the bees, who neither suck nor generate their honey from one flower’: The Significance of the *Perigrinatio Academica* for Danish Medical Students in the Late Sixteenth and Early Seventeenth Centuries’, in O. P. Grell et al. (eds.) *Centres of Medical Excellence? Medical Travel and Education in Europe, 1500–1789* (Aldershot, 2010), 171–189.
- 4 Ibid., 175–176.
 - 5 Ibid., 84.
 - 6 A. Cunningham, ‘The Bartholins, the Platters and Laurentius Gryllus: The *peregrinatio medica* in the Sixteenth and Seventeenth Centuries’, in Grell et al. (eds.), *Centres of Medical Excellence?*, 3.
 - 7 M. Fink-Jensen, *Fornuften under troens lydighed. Naturfilosofi, medicine og teologi i Danmark 1536–1636* (Copenhagen, 2004), 237–241.
 - 8 N. W. Bruun and H.-O. Loldrup (eds.), Thomas Bartholin, *Cista Medica Hafniensis* (Copenhagen, 1982), 79, and Grell, ‘Caspar Bartholin’, 78–100.
 - 9 Caspar Bartholin, *De Studio Medico* (Copenhagen, 1628), f.2r–3r (my translation).
 - 10 Ibid., f.2r.
 - 11 C. E. Brochmand, *Vita et Mors Caspari Bartholini* (Copenhagen, 1629), f.B2ff. See also Grell, ‘Caspar Bartholin’, 78–100.
 - 12 Bartholin, *Cista Medica Hafniensis*, 79.
 - 13 Ibid., 80.
 - 14 Fink-Jensen, *Fornuften under troens lydighed*, 293–299.
 - 15 Bartholin, *Cista Medica Hafniensis*, 81.
 - 16 Ibid., 82 and Fink-Jensen, *Fornuften under troens lydighed*, 319–320.
 - 17 Bartholin, *Cista Medica Hafniensis*, 83.
 - 18 Ibid., 84.
 - 19 Ibid., 85.
 - 20 Ibid., 86.
 - 21 H. D. Schepelern (ed.), *Breve fra og til Ole Worm*, vol. 3 (Copenhagen, 1968), no. 1459 (my translation).
 - 22 Ibid., 1536.
 - 23 Ibid., 1572.
 - 24 Ibid., 1605 (6/9/1648).
 - 25 Ibid., 1663 (2/11/1649).
 - 26 Ibid., 1670 (6/1/1650).
 - 27 Ibid., 1694 (23/5/1650).
 - 28 Fink-Jensen, *Fornuften under troens lydighed*, 286.
 - 29 Bartholin, *Cista Medica Hafniensis*, 86–94.
 - 30 Thomas Bartholin, *De Peregrinatione Medica* (Copenhagen, 1674); English translation in C. D. O’Malley, *Thomas Bartholin on the burning of his Library and On Medical Travel* (Kansas, 1961).
 - 31 Schepelern, *Breve fra of til Ole Worm*, vol. 2 (Copenhagen, 1967), nos. 722 and 739 (my translation).
 - 32 O’Malley, *Thomas Bartholin*, 47.
 - 33 Ibid., 48.
 - 34 Ibid., 50.
 - 35 Ibid., 53.
 - 36 Ibid.
 - 37 Ibid., 55.
 - 38 Ibid., 56.
 - 39 Ibid.
 - 40 Ibid., 59.
 - 41 See Theodor Zwinger, *Methodus apodemica, in eorum gratiam, qui cum fructu in quocunque tandem vitae genere peregrinari cupiunt* (Basle, 1577); see also Anthony Grafton, *What was History? The Art of History in Early Modern Europe* (Cambridge, 2007), 119–120 and Paola Molino, ‘Alle origini della Methodus Apodemica di Theodor Zwinger: la collaborazione

de Hugo Blotius, fra emperismo ed universalis' *Codices Manuscripti/Zeitschrift für Handschriftenkunde* 56/57 (2006), 43–67.

42 O'Malley, *Thomas Bartholin*, 101.

43 Fink-Jensen, *Fornuften under troens lydighed*, 320–321. See also Caspar Bartholin, *Astrologia seu de Stellarum, affectionibus et effectibus* (Wittenberg, 1624), 219.

10 The natural philosophy of Sigfrid Aronus Forsius

Between the created world and God

Terhi Kiiskinen

The Swedish/Finnish minister, astrologer and almanac writer Sigfrid Aronus Forsius (ca.1560–1624) was an industrious author, publishing more than sixty pamphlets from 1606 until his death in 1624, mostly almanacs and prognostica, but also works on comets, funeral sermons, biblical chronology, hymn books and sermons were among his publications, not to mention his large unpublished work on natural philosophy, *Physica*.

Little, however, is known about Forsius's early life and education. He is assumed to have been born around 1560, most likely in Helsingfors in Finland then part of Sweden, as can be seen from his use of the Latinised surname Helsingforsius. For someone who published at least twenty-six almanacs and *Prognostica* between 1606 and 1623, not to mention a variety of other publications from funeral sermons, via biblical chronologies to hymn books, just to mention some of his many publications, nothing is known about him until 1591 when he is briefly referred to as a preacher and schoolteacher at the cathedral school in Reval (today's Tallinn in Estonia). Judging from his works, he received a solid tertiary education in Latin, natural philosophy, mathematics, and theology, but whether he received it in Sweden at the University of Uppsala before its closure in 1580, at the Royal College in Stockholm, or abroad at one of the Protestant, German universities favoured by Swedish students is not known.¹

Forsius appears to have remained in his teaching position in Reval until he matriculated at the newly reopened University of Uppsala in 1595. His stay at the University, however, proved short since he was appointed headmaster at the school in Narva in Estonia in November 1596. Three years later he had joined the army of Duke Charles in the War against Sigismund as a chaplain, later claiming to have become court chaplain to the Duke who had by then become King Charles IX of Sweden (1599–1611). Whatever position Forsius occupied his astronomical and mathematical talents appear to have been recognised within the court of Charles IX since he was commissioned to join the geographic expedition the King dispatched to Lapland in the winter of 1601–1602 to determine the border between Norway and Sweden. Simultaneously Forsius was rewarded with the income from a vicarage for his services to the crown. This proved a highly successful period of Forsius's life with no shortage

of patrons, and in 1605, he was able to obtain funds for a study tour of northern, German cities such as Lübeck, Wismar and Rostock where he befriended the physician David Herlitz (1557–1636), whose interests in astrology and mathematics corresponded with his own.

Back in Sweden in the summer of 1606, while making plans for his immediate return to Germany, Forsius ran into serious trouble for the first time when he was arrested on the order of Charles IX. Forsius had shown what can only be described as serious political naivety, having while in Germany translated an ‘Oration and Invective’ against King Charles IX into Swedish. He was eventually released the following spring having repeatedly emphasised his innocence. Later that autumn, Forsius sought to improve his relations with the crown publishing a pamphlet about the recent comet, which he dedicated to Charles IX.

It would appear that his efforts to ingratiate himself once more with Charles IX were successful, since the King commissioned him in the spring of 1609 to take the Chair in Astronomy at the University of Uppsala while its regular occupant was suspended. Forsius’s appointment meant that he entered the University as the King’s man. As such, he immediately became drawn into a major political power struggle within the University between the majority of the University professors led by the professor of Hebrew, Johannes Rudbeckius and another Royal appointee, the Law Professor, Johannes Messenius. It was probably difficult for Forsius to avoid joining hands with Messenius, both of them were considered ‘outsiders’ by their academic colleagues. Thus, he appears to have been the only supporter of Messenius at a turbulent meeting of the University council in January 1610 where he found himself accused of being drunk and intoxicated. This accusation is notable for providing the first reference to Forsius’s excessive drinking habits, which caused him repeated difficulties until his death in 1624.

Forsius appears to have relinquished his chair in astronomy during the autumn of 1610 after less than eighteen months in the job. We know nothing about his teaching and research while he held the chair, only that he started work on his *Physica*, a vernacular textbook on natural philosophy which he finished the following year. Bearing in mind that Forsius had been encouraged by the King to produce such a textbook, it is surprising that it remained unpublished until 1952.² This, however, may not be unrelated to the fact that Forsius once more found himself in trouble with the authorities in October 1610, being arrested for having been a supporter of King Sigismund during the recent civil war (1597–1599). Forsius was released a year later without charge, but while his incarceration might have made it possible for him to finish his textbook, it undoubtedly diminished its chances of being published.

By 1612, Forsius had settled in Stockholm still publishing his almanacs and once more seeking patronage at the court of Charles IX’s successor Gustavus Adolphus. In August 1613, he was rewarded with a Royal charter giving him control of the trade and publication of almanacs in Sweden. By then he had already begun using the title Royal Astronomer – *Astronomus regius* – in his

works.³ The years 1612–1614 proved to be the pinnacle of Forsius's career. He was rewarded with a stipend from the crown when in early 1613, he was appointed preacher at the Cloister which had housed Johan III's Royal College. However, Forsius soon fell out publicly with his clerical colleagues and found himself and his wife accused of drunken and debauched behaviour. It all culminated when a drunken party at Forsius's residence in the Cloister on Whitsunday 1615 resulted in a fight where one of the guests was murdered. The incidence obliged Forsius to resign his position.

Over the next few years Forsius continued to publish his almanacs and prognostica, while attracting some financial support from a variety of patrons such as Duke Johan of Östergötland and Axel Oxenstierna and for a period returning to his 'old' occupation as army chaplain.⁴

By 1619, Forsius found himself in serious trouble for the third time. This time, it was caused by one of his prognostica, his *Great Prognostication* for 1619 to be precise. Here Forsius had referred to the visions and prophecies of a self-proclaimed prophet, the peasant Jon Olofsson, who had caused some disturbance in the countryside preaching repentance and claiming to be God's prophet sent to proclaim the end of the world. By the time the *Great Prognostication* was published Jon Olofsson had already been arrested, and in January 1619, Forsius was summoned to the Royal court to explain why he supported Jon Olofsson's claim to be a prophet. The King was clearly concerned that Forsius's publication might add fire to the disturbances already caused by Olofsson. In May, Forsius was handed over to the Archbishop and the diocesan chapter of Uppsala for further questioning.

In their investigation, the chapter focussed on Forsius's astrology, which they deemed to have superstitiously overstepped the mark for what was acceptable. In their sentence, they made it clear that Forsius had gone too far in his predictions and demonstrated an irresponsibility not proper for a right-minded and learned minister by accepting Olofsson's claim to be God's prophet. In the end, it was not Forsius's astrology as such which was condemned by the chapter, but the dangerous social and political implications of his support for the self-proclaimed prophet Olofsson. After all, Olofsson was only one among a number of lay prophets and dissenters which at this time were agitating peasants across Sweden with their aggressive preaching and prophecies of the eminent end of time.⁵ By supporting Olofsson's claim to be a prophet called by God, Forsius had once more shown his social and political ineptitude by ignoring the possible political repercussions of such a risky step. Furthermore, the Uppsala verdict undermined his scholarly authority and placed him among the ranks of quacks and charlatans. In a way, the 1619 verdict only served to confirm Forsius's own sense of being an unappreciated outsider constantly opposed by the academic establishment as can be seen from many of the dedications of his almanacs and prognostica.⁶ However, the Uppsala verdict together with his long-standing reputation as a drunkard and a troublemaker served to marginalise him for the last few years of his life, even if he was able to continue producing his almanacs and prognostica.

The natural philosophy of Sigfrid Aronus Forsius

It has been argued that one of the reasons why Forsius's *opus magnum*, his textbook on natural philosophy, *Physica or a Description of the Qualities and Properties of Natural Things*, remained unpublished was due to the Paracelsian ideas it secretly sought to promote. In his work on Paracelsianism in Sweden, Sten Lindroth argued that Forsius was an ardent Paracelsian who had attempted to sneak Paracelsian ideas into his work on natural philosophy, hiding them among the large chunks he had copied from the work of the Lutheran physician Johannes Magirus (c.1560–1596), *Physiologiae Peripateticae libri sex*, published in 1597, in many cases totally out of context with Magirus's text. Magirus textbook on natural philosophy, produced while he was professor of natural philosophy at the University of Marburg proved one of most popular works on natural philosophy in northern Europe in the seventeenth century and went through numerous editions. That Forsius should have used it extensively as a model for his own textbook is hardly surprising.

A comparison of Magirus' and Forsius' texts, reveals that the opening chapters of *Physica* are not based on Magirus' work, but depend on other sources, whereas a considerable proportion of the following chapters are indeed taken directly from Magirus. Even so, it is evident that in these later chapters of *Physica* Forsius also depends on other sources. Furthermore, a closer inspection of the Paracelsian material incorporated by Forsius does not indicate that he was a fervent Paracelsian, but only that he considered Paracelsian ideas noteworthy. Neither did Forsius foist his Paracelsian material inappropriately onto the body of Magirus's Aristotelian ideas, but he only presented interpretations through which Paracelsian views could be considered within the prevailing knowledge.

Physica is, in other words not the badly constructed derivative of Magirus's textbook supplemented with often irrelevant Paracelsian material that we have been led to believe. In fact, Forsius's work has not been given the attention it deserves not least because no one has taken the trouble to carefully study the text until recently.⁷ A full list of the many sources and works used by Forsius in his *Physica* has been compiled in my recent work on Forsius.⁸

Physica or a description of the qualities and properties of natural things

In what follows, I shall focus on Forsius's *Physica*, his main work on natural philosophy, its inspirations and its content. It was intended as a Swedish textbook prepared by Forsius during the brief tenure of his professorship of astronomy at the University of Uppsala, 1609–1610, which he finished in Stockholm in 1611.⁹ It was the first textbook of natural philosophy to appear in Swedish. It is likely that Forsius had received instructions from Royal officials to write a modern, vernacular textbook on natural philosophy, since Charles IX, and especially his Ramist officials in his chancellery, Nils Chesnecopherus and Johan Skytte, wanted to promote university teaching and education in a more

practical direction in general. The need to educate talented youngsters, especially from the nobility, to become well-educated servants of the crown serving the kingdom had become increasingly important during the reign of Charles IX. *Physica* was supposed to meet this educational need. Forsius targeted his work especially at the sons of the Swedish aristocracy, emphasising that the study of nature benefited most areas of the kingdom's economic and social life. The more aristocratic a person was, the more apposite was this 'work of reason', namely, the examination and study of nature.¹⁰

Physica is a remarkable work bearing in mind the social, cultural and educational circumstances in Sweden at the beginning of the seventeenth century. It is written in a lively and clear style and proved a pioneering work both linguistically and philosophically. It is a large work, the Nordström edition (1952) consists of 376 pages, while the original manuscript ends on folio 485r. It takes account of the most recent scholarly research to a far greater extent than the work which provided its framework, namely *Physiologia peripatetica* by Johannes Magirus.¹¹ In many ways, it is typical of natural philosophy by the start of the seventeenth century both in its programme and in its content. It demonstrates an increasing emphasis on practice and experiment and an ambition to reach an audience beyond university students through the use of the vernacular; it is concerned with the revival of the classical authors of the Antiquity who had gained new currency and prevailed alongside contemporary authors; and shows a broad interest in a variety of topics and disciplines all relevant to natural philosophy and an openness to new approaches such as Paracelsianism.

Forsius lays out the rationale for his work on natural philosophy in the introduction to *Physica*. He points out that the Almighty God wisely and wonderfully has created the whole of Nature with all its parts and qualities. God has given an immortal and rational soul, not only to heavenly beings, but to all humans, alone of the animal species, so that Man can examine all of Nature, the great, wide and wonderfully decorated stage on which there are lots of wonderful and sweet things to behold. The purpose of all this is to cause admiration and wonder in Man, to get him interested in contemplating Nature, so that he can find the underlying principles behind natural phenomena and acquire true knowledge of their essences. In the final analysis, to progress from the work to the creator himself.¹²

Forsius continues by recalling that Plato had stated that Man had eyes for that purpose. Eyes alone, however, do not make the difference between Man and ox. That lies in the fact that Man should be able to use his reason, given to him alone of all animals, in order to study and examine all he sees. This is why Man not only has eyes, but is positioned centrally in this edifice in order to study and examine everything around him. This task is the right and proper enterprise for Man.¹³ Forsius also refers to the secular benefits from studying natural philosophy: in matters of state, in the office of teaching, in economics, and in all the liberal arts and craftsmanship. He finishes his introduction with a prayer: 'God, who is the Creator of Nature and is the highest Nature, endow me with Your grace to handle this matter correctly and usefully'.¹⁴

Apart from the work of Johannes Magirus, Forsius found most of his inspiration from a handful of other natural philosophers. He drew on two works by Luther's friend and collaborator Philipp Melanchthon (1497–1560), *Initia doctrinae physicae*, published in 1549 and *De anima* published in 1540; he repeatedly made use of *Sphinx, theologico-philosophica*, published in 1600 written by the Reformed theologian Johann Heidfeld (1563–?1623), the polymath first professor of theology at the Herborn Academy; he also found much inspiration in *De operibus Dei intra spacium sex dierum creatis opus*, published posthumously in 1591 and written by the Italian, Protestant convert Girolamo Zanchi (1515–1590) who settled in Strasbourg, and whose Reformed theology is often difficult to separate from Lutheranism; and finally the work by the Franciscan, Francis Titelmann (1497–1537) *Naturalis philosophiae compendium*, published in 1530, the only Catholic among them. Forsius would also have encountered similar views to those expressed by most of these authors through his reading of the Danish astronomer Tycho Brahe.¹⁵

The introduction to Melanchthon's *Initia doctrinae Physicae* promote the same ideas about the purposes, usefulness and importance of the study of natural philosophy that are put forward in all the above-mentioned works. Melanchthon, Girolamo Zanchi and Francis Titelmann all sought to develop a Christian natural philosophy where Aristotelianism could be moulded together with Christianity with the help of certain provisions from Platonism. All these authors thought that the purpose of studying natural philosophy was to understand God and the created world better and to improve human life. Melanchthon, Heidfeld and Zanchi belonged to a Lutheran-Reformed tradition and wanted to develop a Protestant natural philosophy. As such they were interested in a wide range of areas and their attitude to information originating from different quarters and authorities was open and relatively unprejudiced. These are the same approaches and values we find in Forsius's *Physica*.

Francis Titelmann explained the importance of the study of natural philosophy and its great significance for the development of the soul when such studies had been understood correctly: the ultimate and particular purpose of all good studies was to know and love God.¹⁶ In another passage, he stated that God was the ultimate end towards which we strove and to which we reached out with the help of the instrumental knowledge of God.¹⁷ Titelmann used Aristotelian natural philosophy as the basis for his *Compendium*, but he worked it into a Christian context. He claimed that his book was not purely about natural philosophy and that he applied a mixture of philosophy and theology in order to enable students to know and love God through natural philosophy.¹⁸

Forsius modelled the first book of his *Physica* largely on the work of Titelmann, whereas the themes in his Introduction are inspired by Melanchthon, Heidfeld and Zanchi, who all considered examining and contemplating Nature to be Man's proper work, and being a valuable and useful task.¹⁹ For instance, Melanchthon stated that the whole of nature was like a theatre, which God wanted Man to examine. God had kindled this desire to study Nature in the human heart since understanding Nature was a way to find God while being

useful to Man. One of its fruits was the art of medicine.²⁰ The same view can be found in the preface to the second book of Pliny's *Natural History*, written either by the Wittenberg astronomer and mathematician, Jacob Milich (1501–1559), or Philipp Melanchthon himself.²¹ This edition was used as a textbook for astronomy and meteorology in most Protestant universities. The author appealed to the authority of Paul and emphasised the significance and usefulness of the study of Nature because it led people to God, while implanting piety and virtue in their souls.²²

Girolamo Zanchi espouses identical ideas in his works. According to him, Man was elevated to a much higher level than other beings thanks to the gift of God. Man was situated in the world as if in a vast and decorated theatre (*in amplissimo & ornatissimo isto theatro*). Nothing could be more valuable, sweet and on the whole more appropriate for Man than the study of Nature. Moreover, the nature of God and His attributes or properties could be studied in two ways, either by contemplating God Himself, or by contemplating Nature – His Creation. By examining lower matters one could progress to the higher, moving from the principles of natural things to their Creator and the highest principle, from images to the archetype.²³ Through the study of Nature one could progress, as if climbing a ladder, to a more perfect knowledge of God. Creatures were mirrors of what could not be seen, according to the teaching of the apostle.²⁴ The reference of Zanchi to creatures as mirrors of the invisible refers to the words of Paul in his letter to the Corinthians, which was often used as a justification for speculative natural theology and philosophy: 'Now we see only puzzling reflections in a mirror, but then we shall see face to face'; and '– we all reflect as in a mirror the splendour of the Lord'.²⁵

Identical views can be found in the open letter '*Inclytis utriusque astrologiae alumni* . . . ' included in Tycho Brahe's *De nova stella*, which also emphasises the religious significance of the study of Nature. Brahe argues that Man is positioned in the middle of the universe, the engine house of the world's theatre, in order to study – as in a mirror – the nature and structure of the sphere of the universe, and thus through visible and created things, to learn something of the majesty and wisdom of the invisible and incorporeal God.²⁶

It is noteworthy that Johannes Magirus does not accentuate the special position and duty of Man in Nature. Only in a short introduction to the chapter '*De Homine, ejusque in utero formatione*' at the end of his *Physiologiae Peripateticae* does Magirus focus on Man's exceptional gifts and abilities – his reason, beauty, erect position and his ability to look at the heavens.²⁷ Significantly, he does not justify the practice of natural philosophy in terms of the connection between the Creator and his Creation, but retains the Aristotelian idea of the nature of natural philosophy.

The Aristotelian idea of the relation between natural philosophy, which comprised systematic and certain knowledge on the one hand, and the practical disciplines and arts, which comprised collections of experiences and practices on the other, meant that the borderline between natural philosophy and the arts could be crossed only in one direction. The arts were submitted to natural

philosophy, which produced the knowledge they needed, whereas they in no way contributed to the development of natural philosophy. This would change by the late seventeenth century, but during Forsius's time, the Aristotelian view remained predominant.²⁸

Although Forsius based a major part of his *Physica* on Magirus's textbook, he had to draw on other sources for his opening chapters because he had a different concept of the sciences and the arts, as well as of the range and substance of natural philosophy. He supported the view that divisions between different sciences and disciplines were flexible, and that the range of natural philosophy was wider than assumed within traditional Aristotelianism. His approach was based on the Christian, natural philosophical idea of the study of Nature as a way to God, and on the Paracelsian spirited view of the arts and disciplines.

Forsius, who among his many publications also had produced a couple of hymn books, incorporated no less than five hymns in his *Physica*. At the end of book V dealing with the element of air, he inserted a short hymn of praise. Similarly, at the end of book VI about the element of water, a psalm to the Creator was introduced. A third hymn was placed at the end of book VII about the element of earth. At the end of book VIII about the inhabitants of the earth, another hymn of praise was attached. Finally, at the end of *Physica*, Forsius inserted a much longer hymn of praise to the 'Almighty and incomprehensible Creator covering the content of the whole work'.²⁹ They all served to enhance not only the Christian foundation, but also more specifically the Melanchtonian flavour of Forsius's natural philosophy.

Paracelsian influences on *Physica*

Even if Forsius used the works of Magirus and Titelmann as his basic framework when writing on philosophical questions, he also presented different views. Thus Forsius had no reservations in introducing Paracelsian ideas which he sought to adapt to the conceptual apparatus he was dealing with.

In chapter 3 of book I of *Physica* titled 'On the first beginnings of all natural things that philosophers call principles', Forsius refers to Paracelsus's idea that there were three kinds of *materia prima*: fire or sulphur, salt or balsam that was saltpetre-like in nature, and mercury or liquid.³⁰ Forsius did not think that they could be the prime components of all material things, but only of metals and plants within the earth (*iordzwäxter*) from which it was possible to extract them. He also mentions the Paracelsian notion that the three were present in the elements – in greater or smaller quantities.³¹ By plants within the earth, Forsius meant materials and natural resources growing in the bowels of the Earth, which he dealt with in chapters 3–5 of book VII of *Physica*: metals, minerals, oils etc. This differed from Paracelsianism, as acknowledged by a later reader of the *Physica*, who added in the margin of the manuscript that salt, sulphur and mercury were indeed prime components not only of metals, but also of plants and animals.³² The same commentator also remarked on the treatment

of metals in book VII, chapter 3 of *Physica*, rather irritably advising Forsius to study Paracelsus's works.³³

Forsius also deals with Paracelsus in book I chapter 4, 'On the external principles which are the sources of all things, particularly about the effective causes'.³⁴ He starts by quoting Virgil's *Georgica*: '*Felix qui potuit rerum cognoscere causas*' (happy [is s/he] who is able to know the causes of things), a quotation used by Melanchthon in his declamations.³⁵ Like Melanchthon, Forsius was interested in causes and their complicated network within the visible and invisible universe. It is within this system Forsius sought to incorporate Paracelsian ideas.

In dealing with the actual cause, which in reality meant the secondary effective cause in respect to God, Forsius would appear to have used the text of Magirus as his starting point, according to whom Nature functioned as 'God's instrument and co-worker'.³⁶ Forsius, however, changed the words to 'God's instrument and tool'.³⁷ Here he may well have been inspired by the approach of Girolamo Cardano, not least because Forsius cites him shortly afterwards.³⁸ Another inspiration might have been Paracelsus's ideas about the intellectual rulers or sagani, which came next on Forsius' agenda. The sagani included the pennates of the element of heaven, the lemurs of the element of air, the nymphs of the element of water and the gnomes of the element of earth.³⁹ Forsius refers to the fourth chapter of Paracelsus' *Liber meteororum*. He considered Paracelsus' idea plausible: God might have created these sublime creatures as the rulers of the elements and his co-workers. God did not do everything Himself: just as he did not sew clothes for anyone, but had ordained tailors to do that, and the grass could not grow and achieve its own form without a labourer. According to Forsius, Paracelsus saw the labourer as *vulcanus* or fire, but he himself considered it more reasonable to understand *vulcanus* as natural warmth, which was also a crucial factor in the creation and evolution of beings in the Aristotelian tradition.⁴⁰ According to Forsius, the existence of the rulers of the elements was plausible: they would correspond to the figures of Behemoth and Leviathan mentioned in the Fourth Book of Ezra.⁴¹ If such rulers or intelligences inhabited the elements, they could be interpreted as a determining or ruling level over the elements in the system of efficient causes created by God. Thus it would be natural to call them the prior secondary causes (*causa secunda prior*). The elements, seen in a Paracelsian light, would then be the next level and could be called posterior secondary causes (*causa secunda posterior*), and the instrument of the elements and the corresponding level of causes would then be fire or warmth.⁴² It is interesting to see that, although Forsius was an astrologer, he nevertheless considered it possible to give an important role not only to heaven but also to the other elements and their rulers in the birth and growth of natural beings. Zanchi, for instance, stuck to the primacy of the heavens: he referred to the Scriptures and the Book of Hosea that proved that the first cause of birth and growth was God, the second cause were the heavens with their planets and the third the earth, where creatures were brought into being.⁴³

The material from Paracelsus does not feature very prominently in Forsius's presentation: he did not agree with Paracelsus on the question of *materia prima*, neither did he accept Paracelsus's views on *vulcanus* or fire. Like Tycho Brahe, Forsius confined himself to the doctrine of mixtures, according to which natural warmth that originated from heaven acted as a factor regulating the birth and growth of bodies and beings that were composed of a mixture of elements.⁴⁴ Forsius's attitude in many ways resembles that of Tycho Brahe, although he adopted a somewhat different stance: he valued Paracelsus, but did not adopt any of his doctrines; instead Forsius considered how they might be interpreted in terms of the conceptual system at hand. Furthermore, in dealing with effective causes Forsius adopted Magirus's distinction between the universal cause (*causa efficiens universalis*), which was God, and the particular or secondary cause (*causa efficiens particularis & secunda*), which was Nature, as his starting point. He posited that if the elements of Nature were inhabited by intelligences in the Paracelsian sense, they should be interpreted as a level determining material elements in the category of secondary causes. Thus, he believed that the possible natural spirits or rulers created by God should, as intelligences, be interpreted as secondary in relation to God, but primary in relation to their own elements. Forsius was prepared to align the proposition of Paracelsus with his conceptual system, but he proved unwilling to let it influence the system itself. However, the way in which he presented the ideas of Paracelsus reveals that he was prepared to consider and possibly accept new and surprising views of the natural world if he found them convincing.

Eclecticism as an ideal

One of the most important conceptual models for Forsius was Otto Casmann (1562–1607) who under the tutelage of the influential Marburg professor Rudolph Goclenius had converted to Protestantism, and who proved a mediator between Calvinism and Lutheranism. Otto Casmann eventually settled in Stade in northern Germany as headmaster of the newly opened academy or gymnasium. His many publications on natural philosophy and astrology were widely acclaimed by Protestants in particular. Casmann based his knowledge on observation and experience guided by reason and revelations by God. He did not feel bound by the philosophical authority of the Ancients, and freely discussed new and inconsistent theories, justified by the ideals of freedom, Christian wisdom and the love of truth.

Otto Casmann was of the opinion that natural philosophy and knowledge had made great headway in his lifetime. This new light of knowledge, which illuminated the path of people penetrating the logos of the world, was in his opinion generated by the persistent research carried out with God's consent. Furthermore, he considered the flourishing of natural knowledge and the arts to be a consequence of the liberation from the tyrannical slavery into which most people had been imprisoned by the teaching of Aristotle.⁴⁵ However, when it came to theology, freedom meant the accurate study of God's word and

faithful commitment to it.⁴⁶ According to Otto Casmann, the advances in law and medicine represented the greatest achievements of the age. In medicine, Paracelsus whom he labelled ‘the reborn Hippocrates’, was important, and in particular the work of his followers had proved very fruitful.⁴⁷ When it came to philosophy, Casmann favoured his contemporary Christian ‘Socratic’ philosophers by which he meant Ramists.⁴⁸

Casmann focussed on both natural philosophy and astronomy. He had studied astronomy not only from the mathematical, but also from the physical and philosophical perspectives and he differed from the traditional Ramist concept of disciplines.⁴⁹ The Word and the wisdom of the Creator provided the foundation for his natural philosophy and research. He admitted that he differed from Aristotle in many respects, stating that he had been forced to abandon many Aristotelian concepts to satisfy his dedication to love of the truth.⁵⁰

Casmann was inspired by scholars across Europe, often highly regarded, who had rejected Aristotelianism in many areas. He referred to eclectics and syncretists who were influenced by Neoplatonism, Stoicism, the Hermetic tradition and Paracelsism, such as Tycho Brahe, John Dee, Guillaume Postel, Hieronymus Monutius, Francesco Patrizi, Cornelius Gemma, Michael Maestlin, Christopher Rothmann and Tadeas Hájek.⁵¹

In the preface to his *Astrologia, chronographia et astromanteia* (1599), Casmann claimed that he had been influenced from a variety of authors and that he believed that natural philosophy could not progress unless one was prepared to question the authority of Aristotle. In breaking away from Aristotle he did not seek to substitute one authority for another. In emphasising the significance of observation and experience guided by reason for the development of knowledge, Casmann argued for the freedom to philosophise rejecting the authority of Aristotle and the right to apply the methods and approaches of a variety of subjects and disciplines to one field of research unrestricted by Ramism.

Forsius shared this view of natural philosophy with Casmann. Eclecticism was one of his ideals: the most reasonable and truthful ideas were to be adopted, even though they were not necessarily promulgated by leading scholars of a certain school. Moreover, Forsius thought that the interaction involved in crossing the divisions between philosophy, natural philosophy and the arts was not only admissible, but desirable. This can be seen in *Physica*, but Forsius made it even more explicit in the Latin apology he produced in connection with his trial in Uppsala in 1619.⁵² He referred to certain disciplines, such as astrology, meteorology, anthropology, physiognomy, chiromancy and chemistry, as subjects (*artes*) created by the science of natural philosophy (*physica scientia*).⁵³ Thus Forsius admitted that natural philosophy underpinned the subjects or arts. Defending the questionable arts, he claimed that all philosophy was established by argument and experience,⁵⁴ which meant that experience also had a constructive role. Astrology was one of the experience-based arts, which had been given to Man in order to promote knowledge and wisdom. Those who did not want to acquire knowledge and wisdom hated – ‘by Hercules’ – not only the art, but the Master himself.⁵⁵ Here Forsius presented the practice of increasing

knowledge (*scientia*) and wisdom (*sapientia*) through research as a duty set by God. This idea was among others characteristic of the Paracelsians.

Moderate scepticism and the sources of knowledge

Forsius retained a form of scepticism which found expression in what can only be described as his eclecticism. This was a facet not commonly found among more traditional Aristotelians or Christian thinkers. It was not scepticism about the possibilities of knowledge in general, but it concerned authorities – especially when their opinions were contradictory. This moderate scepticism can be found particularly in the works of Cicero, whose views Forsius would at least have encountered through *Noctes Atticae* by Aulus Gellius. A Christian interpretation of this doctrine can be found in *De operibus Dei* by Girolamo Zanchi, a work known for its aspiration to harmonise the doctrines presented by Moses in the Book of Genesis and those of Aristotle.⁵⁶ However, the ideas of Zanchi about the two books revealed by God to Mankind have attracted less attention than they deserve. First Man was given the Book of Nature, then the Scriptures. Zanchi brings together these two books of divine revelation by emphasising that the revelation provided in the Bible has to be matched and coordinated with the empirical facts found in Nature even if it challenged the opinions of a variety of authorities.⁵⁷ Zanchi thought that the truth as revealed by God could be found in the Scriptures and in Nature, and that the philosophy of Aristotle was right in principle and roughly correct, but that it was not necessary to remain loyal to it. Some scholars have considered Zanchi to be an Aristotelian, but that was never the case.⁵⁸ His focus was not on the ideas of Aristotle, but rather on examining, understanding and harmonising what could be gleaned from the Book of Nature, or God's work, with the Scriptures, the Word of God. Thus, his approach encouraged empirical study and observation rather than the study of authoritative opinions. Furthermore, Zanchi did not believe that the Scriptures contained all necessary knowledge. His position was that a distinction should be made between the opinions of human authorities on the one hand, and the empirical and supra-empirical facts found in Nature and the Scriptures on the other. In addition to this, it was necessary to find out in what respects the Scriptural revelation bound a natural philosopher and what it left to experience and deliberation. For instance, in opposing the opinion of Augustine that there could not be human beings on the other side of the World because the Scriptures did not relate that Noah's sons sailed across the ocean, Zanchi pointed to the fact that neither did the Scriptures deny it, nor did they deny the possibility of people having travelled there later. Here he referred to the purpose of the history of the Creation, namely that it was above all to show how the Church originated and to chart its progress.⁵⁹

Forsius would appear to have adopted Zanchi's idea that the Bible should be taken as a guideline, but only as one authority among others. The Bible did not hold binding authority over things belonging to the domain of reason, such as natural philosophy studied through empirical methods. Forsius took

up the issue of the authority of the Scriptures in a passage in *Physica* where he mocked those theologians who emphasised the spiritual to the extent that they did not believe themselves or anything in the world to be natural, but considered everything spiritual. They believed that only what could be found in the Scriptures was true.⁶⁰ Like Girolamo, Zanchi Forsius repudiated this, pointing to the purpose of the Bible. It was not a textbook of natural philosophy and physics (*philosophia och physiologia*), but rather provided a historical relation of the creation of the World in order to reveal the age of the World, and to provide a record of the propagation, growth and condition of the Church, to awaken faith and exhort people to lead a godly life.⁶¹ Even so, Forsius admitted that the Scriptures also contained much material relevant to natural philosophy. In his view, such matters were dealt with particularly thoroughly in the Books of Solomon,⁶² Syrach, and Job, as well as in the Books of Prophets.⁶³ This view was not only expressed in *Physica*, but also in his Latin apology at his trial in 1619, where he explained his ideas to the ecclesiastical authorities. The Bible was not a manual for natural philosophy or natural history, instead it was God's intention that Man through his study and observation of Nature would come to comprehend the created World.

Forsius frequently drew on the Scriptures when criticising prevalent ideas in natural philosophy. He often introduced a variety of natural philosophical opinions without taking a definite stand himself, just underlining those that were in contradiction to the Scriptures. As such he was close to the anti-authoritarian and questioning environment of the early Reformation where scepticism towards authority and tradition combined with the aspiration to study the original sources of knowledge, rather than the Lutheran orthodoxy which characterised his own period. However, Forsius showed himself cautious when using the Scriptures as a source for natural philosophy.

Despite being a Lutheran minister, Forsius demonstrated a surprising willingness to find inspiration from both Catholic and Reformed authors. As we have seen, he chose the Catholic Francis Titelmann as his main source for the opening chapters of *Physica*, and he took much material from the moderate Calvinist, but pro-Lutheran, Girolamo Zanchi. In fact, Forsius may well have harboured some Catholic sympathies. Thus, he disapproved of the confiscation of Church property, which happened in Sweden in connection with the Reformation. He put forward this opinion in his manuscript of *Physica* from 1611, as well as in a Passion homily he published in 1614.⁶⁴

Bearing in mind that the Swedish Reformation had been slow and fairly tortuous in confessional terms and that Lutheranism was not firmly ensconced until the Uppsala Assembly in 1593, the willingness of Forsius to take a non-confessional approach is perhaps less surprising. Furthermore, in 1599, Charles IX, who favoured moderate Calvinism, had ascended to the Swedish throne. The King maintained close connections with Reformed Germany: he sent students to the University of Marburg, which was founded by Philip I (the Magnanimous) of Hesse, and he married two of Philip's granddaughters, first Maria of Pfalz (1561–1589), and after her death Christina of Holstein-Gottorp

(1573–1625). Under those circumstances, Forsius's choice of main source for his *Physica*, the popular textbook in natural philosophy written by Johannes Magirus, professor in natural philosophy at the University of Marburg, would appear to have been a fairly obvious one.

However, the dependence of Forsius on a Catholic source for his work might have been riskier. However, the material Forsius used from the work of Titelmann did not contain any specifically Catholic ideas, as opposed to Protestant ones, but can only be considered broadly Christian. This way, Forsius could win approval within Christian circles that favoured the development of natural philosophy on a Christian basis, or even a biblical foundation. For Forsius, Christian philosophy and natural philosophy were connected in the study of Nature. This had its origins in the old aspiration of natural theology to acquire knowledge of God and his glory by studying his Creation (*ex creaturis Dei gloria*) and to prove Christianity to be true by analogy. By arguing for a distinctly Christian natural philosophy, Forsius represented a religiously more irreproachable line than the Aristotelians, who might be accused of adopting such anti-Christian ideas as the eternity of the world.

Forsius on medicine, anatomy and physiology

Apart from *Physica*, Forsius also discussed medicine in his *Minerographia*, which he finished at the latest in 1613, but which was not published until 1643, nearly twenty years after his death.⁶⁵ *Minerographia* is an extension of chapters 3 to 5 in book VII in *Physica*, which deal with metals, stones, and other minerals respectively. For these chapters and for *Minerographia*, Forsius drew on a number of authors including Magirus, but not least on his own practical knowledge and experience. The medical uses of minerals originated partly from ancient and medieval traditions in natural histories and lapidaries, and partly from physicians from antiquity to the sixteenth century. Most of them represented classical humoral pathology and astrological medicine, but Forsius also referred to Paracelsus, who promoted chemical medicine, and 'the Florentine physicians', by whom he must have meant the school of Marsilio Ficino. He also drew attention to the fact that chemical medicine was discussed in the compiled works of Johannes Guinter von Andernach, Pierandrea Mattioli and Johann Jacob Wecker. A fair number of the authorities Forsius commented on were also interested in alchemy, while Girolamo Cardano, Konrad Gesner, Johannes Magirus and Julius Caesar Scaliger had written encyclopaedias and general presentations about natural science.

Forsius dealt with these issues from various perspectives, as was common at the time. For instance, what the material in question was called by different authors, its physical qualities, where it could be found and how it could be used in the household and in medical treatment. He repeatedly inserted his own opinions and experiences. Thus, he did not recommend the use of arsenic internally, although he admitted that many significant medical authorities did.⁶⁶

Several sections of *Physica* deal with the human nervous system and the sense organs in considerable detail. In these sections, Forsius depended heavily on Magirus, but also added something new, apparently from his own experience.⁶⁷ Forsius also dealt with human anatomy beginning with the most noble and supreme parts and moving from there to the lower parts in chapters 7 to 9 in book VIII (7: On the organs that serves the capacity of sensing, or the brain; 8: On the torso or the chest that houses the vital organs and faculties; 9: On the lower body that incorporates the faculties of nutrition and reproduction), as opposed to Magirus who had adopted a reverse order in chapters 11 to 13 in book V.⁶⁸ Both Forsius's and Magirus's presentations of the human body are fairly 'modern', but unfortunately neither clearly identifies their 'modern' sources other than referring to 'adherents of new ideas' and 'all the physicians'.

Forsius as well as Johannes Magirus considered the brain to be the seat of sensing in contrast to the traditional Aristotelian notion which placed it in the heart. Furthermore, Forsius saw the *sensus communis* as situated in the brain, whereas Magirus did not mention this capacity at all. The presentation of the macroscopic anatomy of the nervous system is fairly 'correct'.⁶⁹ Thus, Forsius described the hard and soft meninges, the cerebrum, the cerebellum, plus the four cerebral ventricles and the spinal cord correctly. However, in his presentation, there were only seven pairs of cranial nerves, which he labelled 'soft nerves'; on the other hand, there were thirty pairs of spinal nerves, which he identified as 'hard nerves'.⁷⁰ Where Magirus did not mention the spinal cord, Forsius added information on it, explaining that it was of the same substance and essence as the brain. According to Forsius, when someone froze to death, the spinal cord burst.⁷¹ As for the human skull, Forsius noted that in Paracelsus' view, it would have consisted of one bone from the Creation to the Fall, but laconically stated that this opinion was not worth considering.⁷²

Where *Physica* demonstrated a practical medical interest, Johannes Magirus confined himself to describing human anatomy and vital processes in a sort of a mechanical, normal condition. Forsius described physiological variations and their connections to different temperaments and diseases. He discussed curing diseases and mentioned diseases and parts of the body that were especially difficult to heal, such as varicose ulcers and knees.⁷³

All in all, Forsius approached medical issues in the same spirit as he dealt with other natural philosophical questions, maintaining his freedom to choose the best and most reasonable ideas regardless of who presented them, only determined by whether they worked. Something which could only be determined by information gathered through direct observation and experiment.

Notes

- 1 T. Kiiskinen, *Sigfried Aronus Forsius. Astronomer and Philosopher of Nature* (Frankfurt am Main, 2007), 30–34.
- 2 Sigfriedus Aronus Forsius, *Physica*: (Cod. Holm. D76). I, Text ed. Johan Nordström (Uppsala, 1952).

- 3 M. Kjellgren, *Taming the Prophets: Astrology, Orthodoxy and the World of God in Early Modern Sweden* (Lund, 2011), 204–205.
- 4 Ibid., 210–214.
- 5 Ibid., 226–240.
- 6 Kiiskinen, *Sigfrid Aronus Forsius*, 63, 129–131.
- 7 Johan Nordström, who published Forsius's *Physica* in 1952, had intended to supply it with a commentary, see S. Lindroth, *Paracelsismen I Sverige till 1600-talets mitt* (Uppsala, 1943), 395, n. 4. However, he made extensive notes on *Physica*, as can be seen from his manuscripts in the University Library of Uppsala (J. Nordströms efterlämnade papper, okatalogiserade, no. 13). A comparison of Nordström's notes with Lindroth's book reveals that Nordström had noted Paracelsian influences in *Physica* and shared his observations with Lindroth.
- 8 Kiiskinen, *Sigfrid Aronus Forsius*, Appendix 2, 363–464.
- 9 For more details, see Ibid., 135.
- 10 Forsius, *Physica*, 8.
- 11 This work had apparently reached Sweden via two influential men in the chancellery of Charles IX, Niels Chesnecopherus (1574–1622) and Johan Skytte (1577–1645) who had both studied at the University of Marburg.
- 12 Forsius, *Physica*, 8, 5–14.
- 13 Ibid., 15–19.
- 14 Idem, 9, 5–7.
- 15 For further details, see Kiiskinen, *Sigfrid Aronus Forsius*, chapters 8 and 10. Much in *Physica* could have been inspired by *Oratio de hominis dignitate*, by Giovanni Pico della Mirandola. However, Forsius did not necessarily adopt his ideas directly from Pico, since many of his authorities wrote in a similar vein. For Johannes Heidfeld, see H. Hodson, *Johan Heinrich Alsted, 1588–1638. Between Renaissance, Reformation, and Universal Reform* (Oxford, 2000), 40, 43.
- 16 Francis Titelmann, *Naturalis Philosophiae Compendium sive De Consideratione rerum Naturalium, Libri XII*, 1530 (Antwerp, 1561), see dedication 'Optimae studiorum —', 2^v. Cf. also I:1, and 6^r.
- 17 Titelmann, *Compendium*, II:18, 30^r, 30^v; Cf. Forsius, *Physica*, I:5, 24.
- 18 Titelmann, *Compendium*, 2^v.
- 19 J. Heidfeld, *Sphinx, Theologico-philosophica* (Herborn, 1602), cap. 11, 155; cap. 33 (De Astronomia), 452; and G. Zanchi, *De Operibus Dei intra spacium sex dierum creates opus (1591)* (Heideberg, 1605), fol. iiij^r; II:I:1, col. 218.
- 20 P. Melanchthon, *Initia doctrinae physicae (1549)*, in Carl Gottlieb Bretschneider (ed.), *Corpus Reformatorum*, Ser. 1, vol. XIII (Halle, 1846), col. 189–190.
- 21 According to some sources, the commentaries published under Milich's name were for the most part written by Philip Melanchthon, see L. Thorndike, *A History of Magic and Experimental Science*, vol. V (London, 1953), 387.
- 22 J. Milich, 1543, Pliny, Liber II C, *Plinii de Mundi historia*, 'Epistola nuncupatoria, fol. Aiv^v.
- 23 Zanchi, *De Operibus Dei*, fols. ij^v, iij^v.
- 24 Zanchi, *De Operibus Dei*, II:I:1, col 219; fol. ij^v.
- 25 1. Cor. 13:12; 2. Cor. 3:18.
- 26 T. Brahe, *De Nova Stella*, fol. E4^{r-v}, T. Brahe, *Opera omnia*, ed. I. L. E. Dreyer, Copenhagen 1913: I, 35.
- 27 Johannes Magirus, *Physiologia Peripateticae libri sex (1597)* (Wittenberg, 1606) V:15, txt. 2–3, 446; & comm. a, 452–453.
- 28 H. Mikkeli, *An Aristotelian Response to Renaissance Humanism: Jacopo Zabarella on the nature of arts and Scinces* (Helsinki, 1992), 180; P. Smith, *The Business of Alchemy: Science and Culture in the Holy Roman Empire* (Princeton, 1994), esp. 33–41, 45–50; S. Smith, *The Body of the Artisan. Art and Experience in the Scientific Revolution* (Chicago, 2004), esp. 17–20.
- 29 Kiiskinen, *Sigfrid Aronus Forsius*, Appendix 3, 465–477.

- 30 Forsius provides as reference chapter 2 from Paracelsus, *Liber Meteororum*, Karl Sudhoff (ed.), *Theophrastus von Hohenheim gen. Paracelsus. Sämtliche Werke*, vol. 13 (Munich and Berlin, 1931), 539; see chapter 3 book 1 of Forsius, *Physica*, 13, 33 – 14, 3.
- 31 Forsius, *Physica*, I:3, 14, 3–7.
- 32 Idem, 14, Nordström's note 3.
- 33 Idem, 175, Nordström's note 8.
- 34 I:4 Om the wthwärtens Principia, som äre alle tingz Orsaker, och i synnerhet om the werckande Orsaker, in Forsius, *Physica*, 17–22.
- 35 See also Milich's commentaries on the second book of Pliny's *Natural History* (1543, 6^v).
- 36 '– organum & σύνερον est Dei'. In Magirus, *Physiologiae*, I:3, txt. 9, 42.
- 37 Forsius, *Physica*, I:4, 19, 8–11.
- 38 Ibid., I:4, 19, 22–27; 'Dei altissimi Coelum est instrumentum—', in Cardano, *Aphor.*, Segm. I, aphor. 58.
- 39 Ibid., I:4, 19, 28–33.
- 40 Ibid., I:4, 20, 8–13.
- 41 Now the Second Book of Esdras.
- 42 Forsius, *Physica*, I:4, 20, 27–29.
- 43 Zanchi, *De operibus Dei*, II:III:1, col. 324; Hos. 2:21–23.
- 44 For Tycho Brahe's opinions, see, for example, his letter to Christopher Rothmann 17.8.1588, *Epistolarum astronomicarum liber primus* (1596), 106–107; *Opera omnia*, ed. Dreyer, VI (Copenhagen, 1919), 135.
- 45 O. Casmann, *Astrologia, chronographia et astromanteia* (Frankfurt, 1599), fol. 2^{r-v}.
- 46 Ibid., fol. 2^v–3^r.
- 47 Ibid., fol. 3^v.
- 48 Ibid., fol. 3^v–4^r.
- 49 The Ramist Law of Justice (*lex iustitiae*), required that a tenet naturally belonging to one art was not allowed to appear in another. For instance, the motion of the heavenly bodies belonged to astronomy, and astronomy was to be considered part of physics (physics being the science of movable bodies) and only physics. Therefore, mathematical doctrines were not to be mixed up in the examination of phenomena pertaining to physics. See E. Sellberg, *Filosofin och nyttan. Vol. 1. Petrus Ramus och ramismen* (Gothenburg, 1979), 40–43.
- 50 Casmann, *Astrologia*, fol 4^r.
- 51 Ibid., fol. 4^{r-v}.
- 52 Forsius, *Scriptum apologeticum*, in F.W. Pipping, *Historiske bidrag till Finlands calendariografi* (Helsingfors, 1858), Litt. A, 115–129.
- 53 Ibid., 116.
- 54 Ibid., 'Rationibus enim et experientia tota firmatur Philosophia'.
- 55 Ibid., 121–122.
- 56 Lindroth, *Paracelsismen i Sverige*, 207.
- 57 Zanchi, *De operibus Dei*, Epistola dedicatoria, fol ij^{r-v}; Zanchi, *De operibus Dei*, II:I:1, col 217–218.
- 58 P. Petersen, *Geschichte der aristotelischen Philosophie im protestantischen Deutschland* (Leipzig, 1921), 122 labels Zanchi 'a genuine Aristotelian and Lindroth', *Paracelsismen i Sverige*, 207, also considers him an 'Aristotelian'. S. Kusukawa, *The Transformation of Natural Philosophy. The Case of Philip Melanchthon* (Cambridge, 1995), 206–207 provides a richer and a more accurate picture of Zanchi.
- 59 Zanchi, *De Operibus Dei*, V:VI:9, col. 416. Augustine's argument is to be found in his *De civitate Dei*, V:VI:9. It is worth noticing that Zanchi, who admired Augustine so much as to divide his own work into books and chapters in accordance with those in his master's great work, nevertheless could take an opposing stand when he saw it necessary.
- 60 Forsius, *Physica*, IV:4, 92, 22–25.
- 61 Ibid., 26–31.

- 62 Forsius had in mind particularly the *Wisdom of Solomon*, to which he frequently made reference.
- 63 Forsius, *Physica*, IV:4, 92, 31–33.
- 64 Ibid., VIII:15, 278; Forsius, *Om Långfredaghen*, 44.
- 65 In the dedication of the almanac and minor prediction for 1614, which was dated 24 August 1613, Forsius refers to his two finished works in the Swedish language, a description of the whole nature, or all natural beings, called *Physica*, and a description of all metals, minerals and precious stones [or *Minerographia*], fol. [18^{r-v}].
- 66 Forsius, *Minerographia*, 30.
- 67 Forsius, *Physica*, VIII:3, VIII:5, VIII:7; Magirus, *Physiologia*, V.
- 68 Forsius, *Physica*, VIII:7–9.
- 69 M. J. Haltia, ‘My Brain is Thinking. The Early Phases of Neuroscience in Finland from the Seventeenth to the Twentieth Centuries’, in *Hippocrates, Annales Societatis Historiae Medicinae Fennicae* (2003), 56–57.
- 70 Forsius, *Physica*, VIII:3, 227; Haltia, ‘My Brain’, 57.
- 71 Forsius, *Physica*, VIII:5, 234.
- 72 Ibid., VIII:4, 229–230. The opinion is put forward in the spurious Paracelsus, *Liber Azoth*, XA, 45, Sudhoff, 14 (Munich and Berlin, 1933), 580.
- 73 Forsius, *Physica*, VIII:6.

11 Johannes Bureus and the *prisca astronomia*

A Lutheran antiquary engages
with the new science

Matthew Norris

Johannes Thomae Agrivellensis Bureus (1568–1652) was a busy man around the turn of the seventeenth century. After a short and unexceptional academic career at a makeshift college set up in Stockholm during Uppsala University's long period of dormancy (c. 1520–1593), he was hired in 1590 as a clerk at the Royal Chancery during the reign of John III, a ruler who had attempted to balance his Protestant upbringing with his sympathy for the Catholicism of his Polish wife Catherine Jagiellon by introducing an ecumenical programme of liturgical reform that served only to infuriate his subjects of all religious confessions.¹ Within two years' time, the king had died and power passed to his son Sigismund, an unapologetic Catholic who was already serving as king of Poland, and who was viewed as having designs to establish a foothold for the Counter-Reformation in Sweden. Almost immediately, John's brother, Duke Charles of Södermanland (later Charles IX), rallied Protestant support in order to seize effective control of the country during his nephew's absence. It was during this turbulent period of shifting political and spiritual allegiances that Bureus, the son of a well-respected Lutheran pastor, emerged as an important intellectual figure attached to the new Protestant regime, Charles having been impressed by his polymathic talents no less than his correct religious background.²

Yet for the better part of a decade, Charles's patronage tended to manifest itself in the form of promises rather than payments. And to make ends meet during these lean years Bureus turned to repairing clocks, designing seals, composing 'hieroglyphic' verses to celebrate the marriages and deaths of wealthy noblemen, and driving the corpse wagon through the streets of Uppsala during outbreaks of disease.³ He spent his days copying and filing documents at the chancery, and his evenings devising cipher scripts inspired by his well-thumbed copy of Johannes Trithemius's *Polygraphiae libri VI* (1518).⁴ He taught himself to read runic inscriptions by studying a partially visible stone that had been used during the construction of the thirteenth-century Franciscan monastery church in Stockholm, a breakthrough that would spawn a fifty-year project to compile and publish a complete sylloge of the surviving runic monuments in Sweden.⁵ He travelled through the northern provinces noting dialectical variations in the speech of rural peasants, the hexagonal shape of snowflakes, and the remarkable sangfroid with which Lapp mothers dunked their newborn

children in icy water to the brink of suffocation in order to harden them to the harsh arctic climate.⁶ In the spring of 1603, he rode on horseback to participate in border negotiations with Denmark as an expert on heraldry, gritting his teeth the entire way owing to a ‘broken leg’ procured while surveying local antiquities – including the eighty-foot long grave of an ancient giant – over the course of the preceding days.⁷ Yet in the midst of all these diverse occupations, he found time in the early hours of the morning to observe the movements of the stars and planets with homemade instruments, and grapple with the newest theories that sought to explain them. In the process he became the first Swedish scholar – by several decades – to openly embrace the Copernican model of the cosmos.⁸

The purpose of this chapter is not to call attention to a previously overlooked figure in the astronomical revolution of the late Renaissance. Bureus’s surviving notes on astronomical topics are fragmentary, sporadic, and despite his own constant assertions to the contrary, largely derivative. Yet taken together, they paint a portrait of a man who was at home in a world in which the seemingly mutually exclusive concepts of innovation and renovation converged in ways that remain difficult to fathom. A traditional interpretation has long portrayed the emergence of science in the late Renaissance as a drawn out struggle in which the champions of the new science contended against the defenders of the old erudition, losing a number of memorable battles before finally winning the war. But a far richer and more nuanced picture of the interaction between science, scholarship, and spirituality has emerged over the course of the last few decades. As Anthony Grafton has remarked in an insightful study of Johannes Kepler’s reading of ancient texts: ‘Relations between the book of nature and the books of men, the study of nature and that of antiquity, were tangled in the period 1550 to 1650’.⁹ The intermingling of these categories was especially pronounced in the case of those individuals for whom the ‘book of nature’ was much more than a mere metaphor, believing that God had inscribed his own perfect wisdom into the things of nature in the form of hieroglyphic signs or signatures; scholars for whom the oldest and most sacred ‘books of men’, both those of the biblical patriarchs and those of the ancient pagan sages and poets, had been written by means of divine dictation. Bureus was one of these scholars. He wandered, comfortably and confidently, through an epistemological landscape in which the oldest textual sources and the newest observations stood as equally lucid points of orientation, where erudition and empiricism merged seamlessly in scholarly discussions on topics as diverse as the anatomy of elephants and the topography of ancient Rome, and where gradually widening cracks and fissures in the once homogenous conception of the natural world intersected with still more visible rifts in the contemporary perception of correct spiritual belief and practice. For the modern reader accustomed to viewing the scientific revolution as a series of violent clashes between fundamentally incommensurable methodologies and mindsets, it is perplexing to find Bureus heaping praise on Galileo’s recent telescopic discoveries in the midst of an interpretation of the structure of the universe based on a close reading of the

Hebrew text of the Pentateuch.¹⁰ Without batting an eye, he could describe his method for the attainment of knowledge as deriving from a union of ‘the instruments of reason, authority, and experience’.¹¹ The following is an attempt to give a brief sketch of the ways in which these instruments operated and overlapped in his career-long encounter with astronomical revolution.

Astronomia nova

A keen student of origin myths, Bureus had a propensity for depicting his first encounters with scholarly disciplines as a series of spontaneous intellectual revelations. His description of his earliest plunge into the bracing waters of Renaissance astronomical theory was no exception. In a retrospectively written note he claimed that on 6 July 1595, at 3:00 a.m., he had worked out on his own – prior to having read about it in an astronomical textbook – that Mercury and Venus revolve around the Sun, a structural emendation that explained the phenomenon of the retrograde motion of the two planets.¹² This abrupt description of what at the time he had perceived to be a new and original cosmological model does not of course necessitate that he was proposing a full-fledged heliocentric system. His description of the solar orbits of Mercury and Venus would have conformed perfectly well with any one of the many geoheliocentric systems that had sprouted up like gnarled chanterelles in the sweaty intellectual greenhouse of late-sixteenth-century natural philosophy, the most famous being the influential compromise model designed by the Danish astronomer Tycho Brahe a decade earlier. Although the characteristic brevity of the retrospective note on the discovery of 1595 makes it impossible to determine exactly what he had in mind, it is safe to assume that if he had in fact conceived of a geoheliocentric model of the universe, it was not to be confused with Tycho’s. A tense political situation with roots in the dissolution of the Kalmar Union in 1523, which had manifested itself in the intervening decades in a series of violent encounters waged both on the battlefield and through the printing presses, hindered the cross-pollination of ideas between Copenhagen and Stockholm.¹³ By the early years of the seventeenth century (when the retrospective note appears to have been written), Bureus had already managed to establish himself in the small inner circle surrounding Duke Charles, whose detestation of all things Danish was only outweighed by his animosity for the deposed king Sigismund. It would therefore seem unlikely that Bureus, who throughout his early career profiled himself as a restorer and defender of Swedish dignity, and whose first publication missed no occasion to snub the cultural and political pretensions of the Danes,¹⁴ could have imagined that his still unstable position in the new regime would have been improved by pledging his allegiance to a theory proposed by the de facto royal astronomer of Frederick II.

Yet whatever genuine aversion he and his patron may have had for their southern neighbours, it did not prevent Bureus from going out of his way to procure the newest works written by Danish scholars. As Henrik Sandblad

noted in a still useful overview of the reception of Copernicanism in Sweden, at some point in his early career Bureus came into possession of a copy of Tycho's *De mundi aetherei recentioribus phaenomenis* (1588), which included the earliest published depiction of the Tychonic system, and which he filled with marginal notes that nevertheless give no indication that he found his Danish adversary's arguments for a hybrid system centred on a stationary Earth convincing. Above all, Bureus appears to have been interested in Tycho's discussions of competing astronomical hypotheses, noting to himself at one point that he should attempt to acquire a copy of Thomas Digges's *Alae seu Scalae Mathematicae* (1573), a work Robert Westman has described as 'the most substantive presentation of Copernicus's hypotheses to appear in print since the foundational works of the early 1540s'.¹⁵ This is not to say that he found Tycho's publications to be of no value. In a list of astronomical works he considered 'most useful' placed at the beginning of one of his notebooks, he included the '*De Restauratione Astronomiae* of Tycho Brahe', a descriptive title that can refer either to the *Astronomiae Instauratae Mechanica* (1598) or the more comprehensive *Astronomiae Instauratae Progymnasmata* (1602).¹⁶ In either case, however, it is clear from Bureus's own notes on astronomical topics in the same notebook that if Tycho had any significant influence on him, it was not as a theorist, but as a careful recorder of observational data and an inventor of technical instruments.

Perhaps the greatest indication that Bureus's earliest attempt at constructing a cosmological system was significantly different than his Danish predecessor's was the widely disparate theoretical starting points from which the two men approached the problem of the structure of the universe. The Tychonic compromise was designed in no small part to purge the Copernican system of the theologically and philosophically problematic element of the Earth's movement, a cumbersome pill that even the otherwise positively inclined Philipp Melanchthon had found too hard to swallow.¹⁷ The question for Bureus, conversely, was never whether or not the Earth moved, but rather how its incontestable motion could best be described. Although none of his notes from the original discovery of 1595 survive, two pages of notes on astronomical topics written in 1601 contain an argument intended to support the theory of the diurnal rotation of the Earth, which demonstrates that even after he had become aware of the heliocentric system laid out in the *De revolutionibus orbium coelestium*, he was reticent to term his cosmology Copernican. Rather, he left it up to the reader to decide:

The fixed stars . . . do not move from their position, for they are flaming bodies. If they moved (and especially if the motion was very rapid) they would undoubtedly project a flaming tail behind them. But the planets, because they are not flaming bodies but rather reflect the rays of the sun, have no tail. Whether this can likewise be determined to correspond with the Copernican theory of the movement of the Earth and the repose of the sun, I leave to the reader.¹⁸

Bureus was thus convinced at an early stage of the Earth's rotation around its axis, but he did not dismiss the possibility that the Earth moved from its position as well. He drew a diagram illustrating what he considered to be the two potentially valid models of the cosmos: one in which the Earth rotated around its axis in a fixed position; the other in which the Earth orbited the Sun.¹⁹ The latter theory of the Earth's movement *e loco* he attributed to Copernicus (neglecting to mention that the diurnal rotation of the Earth was also an element in the Copernican system). The former theory that the Earth moved *in loco* he attributed to two authors. One of these was Nicolaus Reimers, better known in the history of astronomy as Ursus, who had proposed a world system in the *Fundamentum astronomicum* (1588) nearly identical to Tycho's, the most notable difference being the addition of the diurnal rotation of the Earth. As Nicholas Jardine has shown, the almost simultaneous publication of these two largely identical cosmological systems led to a drawn out feud in which each man accused the other of intellectual theft.²⁰ The low point of the dispute came with Ursus's publication of the *De hypothesis astronomicis tractatus* in 1597, a work whose numerous ad hominem jibes caused readers to cringe even in the golden age of the long-winded scholarly invective, in which Ursus dismissed Tycho as a mere 'mechanic' with no understanding of mathematics, and sardonically commended his disfigured Danish rival for being able to make out 'double stars through the triple holes in [his] nose'.²¹ It is no doubt telling of Bureus's opinion of the Tychonic system that in the same list of useful astronomical treatises in which he included an ambiguous reference to Tycho, he added the 'Astronomia Historica' of Ursus, a clear reference to the *Tractatus*, which included a section on the history of astronomical hypotheses intended to demonstrate that all the allegedly new cosmological systems that had emerged in the sixteenth century – with the sole exception of his own – had been bare-faced plagiarisms of ancient models.²²

The other reference to a system in which the Earth moved *in loco* was to a partly original synopsis of the Hermetic philosopher Francesco Patrizi's *Nova de universis philosophia* (1591) titled *Zoroaster, Nova, brevis, veraque de Universo Philosophia* (1593), published in Wittenberg by the ill-fated Jan Jessenius, who in 1621 would have his tongue pried out with tongs before being beheaded in central Prague, along with twenty-six other Protestant agitators, for his role in the Bohemian Revolt.²³ Jessenius's *Zoroaster* is of particular significance in this context as it is the one work containing a 'New Philosophy of the Universe' that we can be certain Bureus had read prior to his discovery in 1595.²⁴ Accordingly, it can be supposed that his first intoxicating introduction to the astronomical revolution of the late Renaissance came from a work that blended together in a complex conceptual cocktail a 'quasi-Copernican' cosmological system, a Christianized rectification of Neoplatonic solar mysticism, a Trinitarian interpretation of the composition of the universe, and a patriotic call for a Protestant restoration of ancient scientific knowledge.²⁵ All of these ideas would prove to have a profound and lasting impact on Bureus, who from the

beginning conceived of his discovery as a component in a larger patriotic antiquarian project aimed at the restoration of ancient Swedish wisdom. In the context of competing world systems, it can be noted that Jessenius followed Patrizi in accepting the Copernican thesis of the diurnal rotation of the Earth,²⁶ but broke from his Italian predecessor by arguing that the Earth was not situated at the centre of the cosmos.²⁷ Bureus was in agreement on both points.

This idea of a decentred Earth led Bureus over time into the even more theologically and philosophically treacherous waters of the infinite universe posited by the Atomists in antiquity, and revived by Cusanus, Digges, Patrizi, and Bruno in more recent times. In a jumbled working list of his later inventions and discoveries, he asserted that ‘no fixed centre of the cosmos can be determined’,²⁸ and that ‘the cosmos is so vast that its centre is everywhere and its circumference nowhere’,²⁹ ideas that clearly derived from Cusanus’s *De docta ignorantia*, a work that would play an increasingly important role in the development of his thought throughout his career.³⁰ His notes from 1601 indicate that although he remained reticent to accept the Copernican system in its entirety, particularly its axiom that the universe was enclosed by its outermost sphere, his thought was already leaning in the direction of heliocentrism. He sketched a model of the Copernican system (albeit placing the fixed stars at varying distances beyond the outermost sphere), and argued that ‘the motion of the planets along the ecliptic demonstrates clearly that the sun remains in its position’ (Fig. 11.1).³¹ Tellingly, the argument is placed immediately after his attempt to prove the stationary nature of the fixed stars by their lack of tails, which suggests that Bureus viewed the tailless fiery body of the sun as one among the innumerable fixed stars in the infinite cosmos.

Yet he did not deny the fixed stars all motion: that they did not move *e loco* did not prohibit them from moving *in loco*. The universe he envisioned was grounded on the premise that all bodies were mobile (*‘Omnia corpora mundana mobilia esse’*),³² an idea once again found in Cusanus,³³ and ultimately deriving from the Platonic notion of the World Soul. And as a direct consequence of this notion of universal animation, he posited the existence of life on other heavenly bodies:

That the fixed stars move in their position (each one around its own poles and centre) is most likely, owing to what has been revealed of the works of God in respect to the motion of the heavenly bodies, [and it follows] that so many bodies of such great size which have not yet come into our comprehension should not be dismissed as motionless and devoid of inhabitants. (This I have discovered previously.) I determine therefore that all the celestial bodies are filled with inhabitants, because when the Earth, which is deemed to be most vile, is by no means devoid of inhabitants, then surely the more noble [celestial bodies] are not devoid of them.³⁴

The idea of life on other heavenly bodies was of course hardly a new one in 1601. Plutarch and Lucretius had both argued in antiquity for the existence of



Figure 11.1 KB MS Ea. 11, fol. 18v. Courtesy of the National Library of Sweden.

extraterrestrial life from very different philosophical standpoints.³⁵ Marcellus Palingenius made the claim in his best-selling didactic poem *Zodiacus vitae* (1536),³⁶ and Giordano Bruno famously set the idea – which he ‘preached . . . throughout Western Europe with the fervour of an evangelist’³⁷ – in a rich philosophical

setting in the *De l'infinito universo et Mondi* (1584) and *De immenso et innumabilibus* (1591).³⁸ In this case too, however, it appears that Cusanus was the direct inspiration for Bureus's theory.³⁹ Yet whereas Cusanus had contended that the supposed depravity of the Earth in relation to the heavenly bodies was an error based on the mistaken Aristotelian conception of a hierarchical cosmological order, Bureus retained the idea of a cosmic hierarchy (albeit one far removed from the Aristotelian model) and turned the base status of the Earth into an argument for the existence of extraterrestrial life.⁴⁰

Bureus's astronomical theories appear to have remained simmering in the back of his mind until the autumn of 1605, when they began to boil over in a flood of creative energy. He spent 'the whole of November and December' engaged in 'studia astronomica'.⁴¹ Several months later, he jotted down the beginning of an outline for what appears to have been intended to serve as an introductory textbook on astronomy, which he prefaced by noting: 'For memory (God willing, I shall write Astronomy in Swedish)'.⁴² Inspired by Tycho's depictions of the astronomical instruments that had been funded by Frederick II for the Uraniborg observatory, he immediately set about developing instruments of his own design that would allow him to base his theoretical speculation on a firm bedrock of empirical observation. He invented an improved astrolabe as well as a new astronomical instrument he referred to as the 'octant' (*Mätteåttung*) (Fig. 11.2). Not satisfied, he invented the 'duodecant' (*Mäte tolfutung*): 'a most convenient instrument . . . the twelfth part of a circle, one-third of a quadrant, to measure elevations of up to 90 degrees through triple *dioptrae*, and the distances between stars up to 30 degrees'.⁴³ In a typically Burean touch, testifying that he conceived his invention in the context of a far more comprehensive project of renovation, he noted that the ancient runic calendar was to be inscribed on the index arm of the instrument. Discoveries and inventions continued to pile up at a frantic pace. On March 21, he discovered a 'geometrical miracle'. Two days later he invented the 'Bureus Plough' (*Bureploegen*), another instrument for measuring celestial angles (Fig. 11.3). He attributed yet another invention to the intervening day, but was in too much of a haste to mention what it was.⁴⁴ Whether any of the instruments Bureus designed in 1606 were actually built is impossible to say. Four years earlier, he had been ordered by Duke Charles to construct a quadrant and an astrolab that were intended to serve an undefined function in the border negotiations with Denmark held in the spring of 1602.⁴⁵ Whether Charles was equally keen to funnel state funds into Bureus's astronomical novelties in the leaner times of his later reign is unlikely. Even the earlier, presumably simpler instruments appear to have been pieced together from scrap metal.⁴⁶

Astronomia sacra

Although the details of the new cosmological system Bureus was hard at work devising in the years around the turn of the seventeenth century remain obscure, it is clear that he did not view his interventions in the field of astronomy as

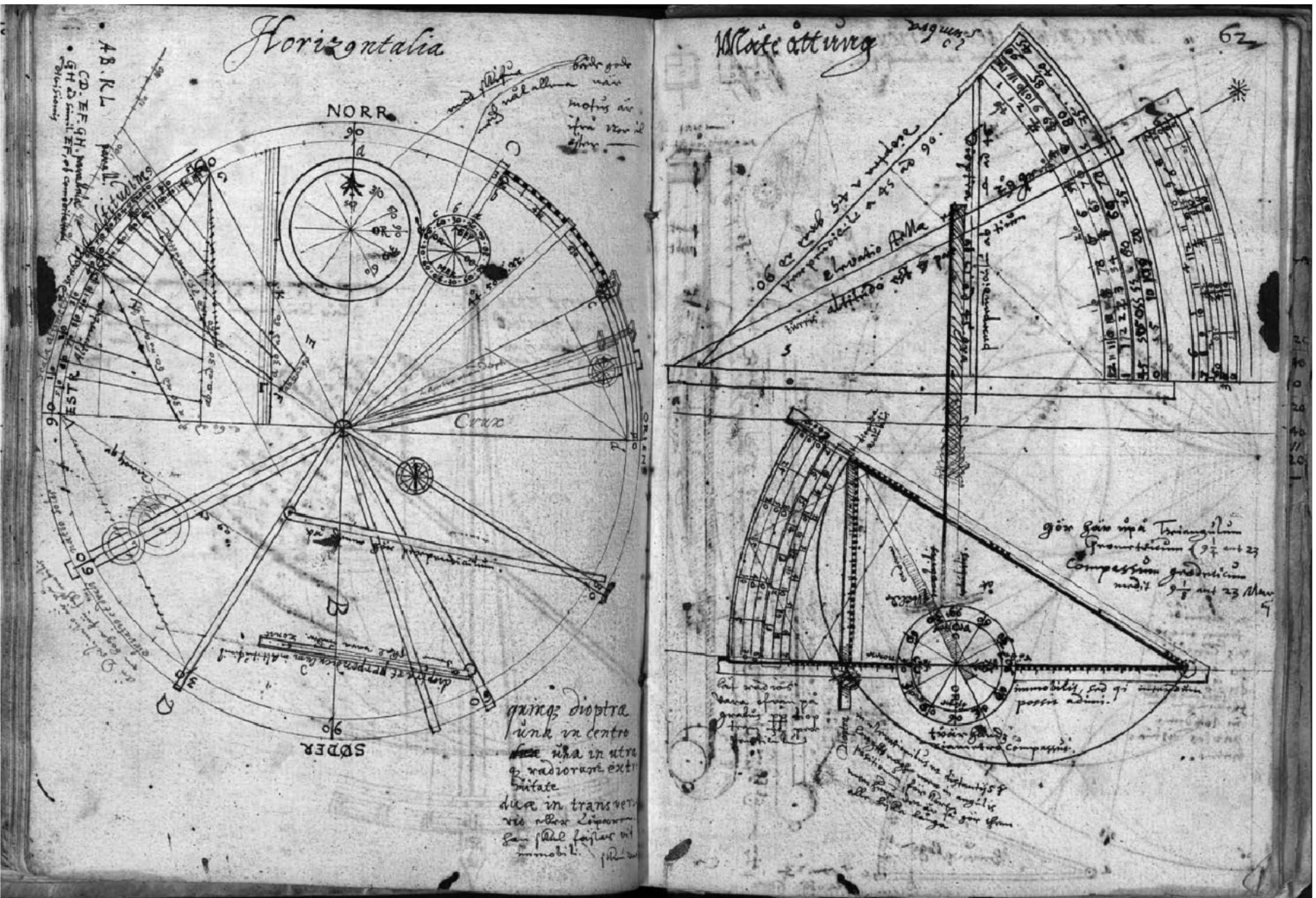


Figure 11.2 Bureus's designs of an astrolabe (left) and 'octant' (right). KB MS Fa. 2, fols. 61v–62r. Courtesy of the National Library of Sweden.

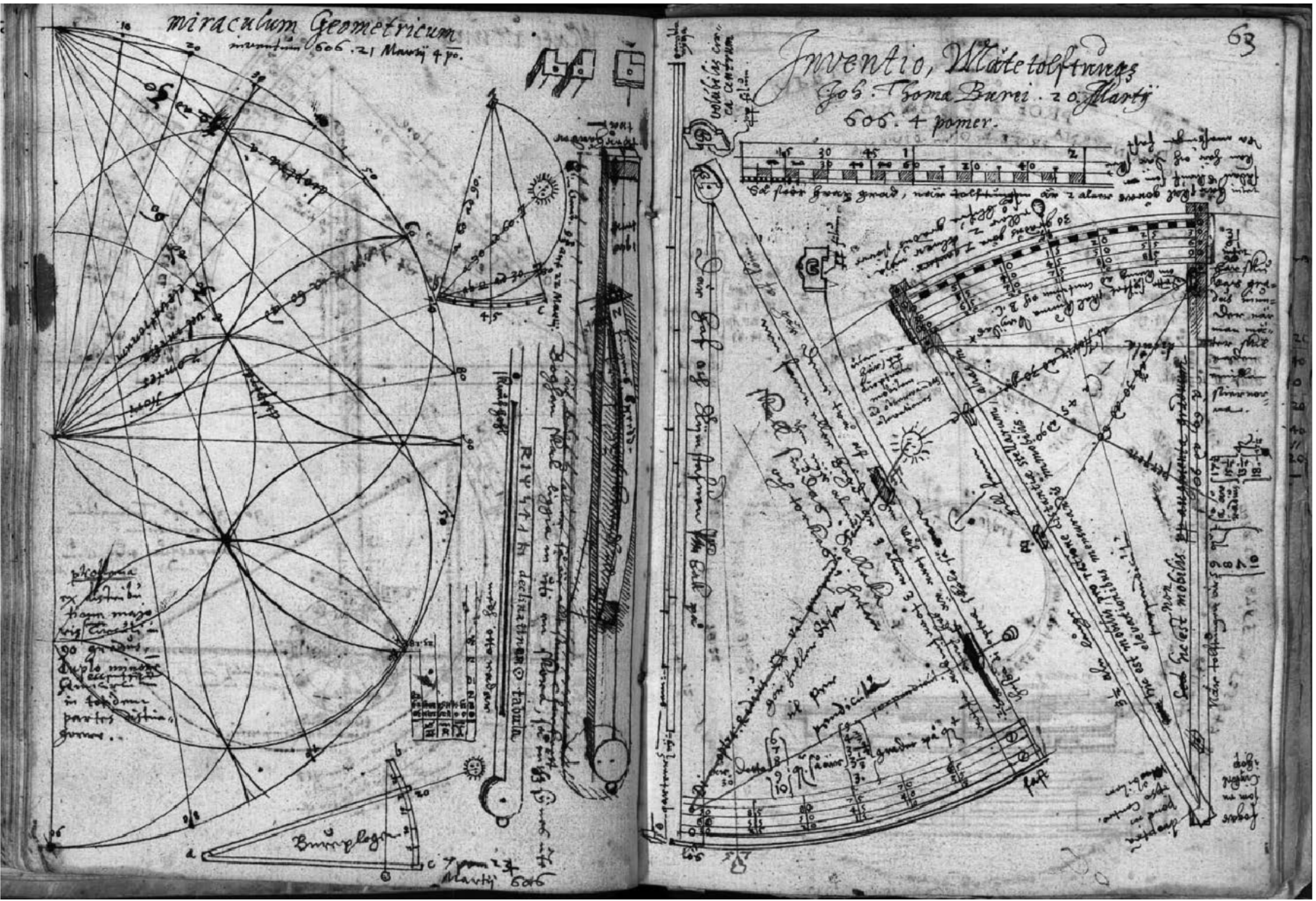


Figure 11.3 Bureus's depictions of a 'Geometrical miracle' (left page, left-hand side), the 'Bureus Plough' (left page, bottom), and the 'Duodecant' (right page). KB MS Fa. 2, fols. 62v–63r. Courtesy of the National Library of Sweden.

a turn away from Christian doctrine, but rather as a critical component of its necessary reform. Traditional interpretations of the astronomical revolution as the outward expression of a gradual shift from a sacred to a secular conception of the cosmos fail to take into account that many of its strongest and most vocal proponents viewed it in the context of an ongoing process of spiritual reformation. Bureus was content to blame the persistence of the geocentric error on the fundamentally misguided scholastic philosophy that had been sanctioned by the papacy for centuries, and which had recently been codified in the curriculum of Jesuit higher education through the *Ratio Studiorum* of 1599.⁴⁷ Reading his notes on astronomical and other natural philosophical matters, one encounters an unmistakable air of *Schadenfreude* as he systematically disassembled the academic philosophy he so despised, and whose eventual subversion would come to set the stage for the Golden Age that would precede the end of time itself. The bitter tone that often accompanies his reflections on the university scholarship of his time testifies that he was all too aware that he was fighting an uphill battle. As early as 1600, he caught wind of a rumour that the professors at Uppsala were standing in the way of his advancement.⁴⁸ His attempt to lecture at the university in the winter of 1617 was met with scornful ridicule.⁴⁹ Later he would spend his nights dreaming of the eventual collapse of ‘academic philosophy’⁵⁰ and directing his gaze on that day in the future when his thought, formerly dismissed as ‘fantasies, trifles, and delusions’,⁵¹ would be redeemed for all to see by the machinations of history itself.

The brunt of Bureus’s diatribes against academic philosophy was directed at Aristotelianism, whose apish practitioners he referred to as ‘a great herd of asses’ (*en stor hoop åsnar*) and, in an oxymoron that highlighted the underlying hypocrisy he found in the Church-sanctioned philosophy, ‘holy pagans’ (*ethnici sancti*).⁵² Yet his grievances were also directed at the philosophical school established by the French-Protestant educational reformer Petrus Ramus, which had managed to win over a great number of converts in Swedish academia by the turn of the seventeenth century, and which despite its militantly anti-Aristotelian rhetoric stressed the mutual independence of the domains of philosophical and theological questioning.⁵³ Bureus’s invectives against ‘academic philosophy’ were thus directed at all schools of philosophy, Aristotelian or otherwise, that failed to recognise the chain of correspondences linking God, Nature, and Man into a unified whole.

By denouncing both Aristotelianism and Ramism he had effectively isolated himself from the whole of the small and tightly knit intellectual community that existed in early-seventeenth-century Sweden. It was a circumstance of which he never tired of reminding himself, and at times he appears to have taken a kind of masochistic pleasure in depicting himself as a misunderstood Messianic figure whose ability to provoke the scorn of professors and priests only testified to the contaminated state of contemporary philosophy and theology. “‘Burn!’ [Combure] my enemies say’, he scrawled on the first page of one of his notebooks, ‘while Christ says, “Come Bureus!” [kom Bure].’⁵⁴ Bolstered by this divine sanction, he pressed on. In a hurriedly scribbled note from the early

1620s, he observed that the difference between the ‘vulgar’ and ‘sacred’ forms of philosophy corresponded with the opposing conceptions of a stationary and moving Earth: Vulgar philosophy dealt with ‘dead stones’ (*mortui lapides*), and it followed accordingly that the earth did not move (*igitur terra non movetur*); sacred philosophy, in turn, proceeded from the principle that ‘everything lives by means of God’ (*Deo omnia vivunt*), which led to the recognition that ‘the earth moves’ (*terra igitur movetur*).⁵⁵ Here was the notion of an enlivened universe that Jessenius had lifted from Patrizi,⁵⁶ who explained the movement of the planets as the living creatures (*animalia*) endowed with soul (*anima*):

[Their nature] is a sort of soul, a rational soul I declare, and it is endowed with intellect, and neither of these can go astray in the celestial region. And they are not, as most of the mass of astronomers and philosophers think, inanimate bodies. But they are, as Zoroaster rightly called them, and after him Plato and Aristotle, animals [*animalia*].⁵⁷

Patrizi’s reference to Aristotle in this passage of course bore no relation to the Aristotelian corpus studied in universities throughout Europe—indeed, the *Nova de universis philosophia* was perhaps the most flagrantly anti-Aristotelian work of natural philosophy that had yet been published, the consummation of the project of philosophical reorientation that he had set in motion in his earlier *Discussiones peripateticae* (1581).⁵⁸ Rather it was a reference to the apocryphal, Neoplatonic *Theology* that he published together with the *Nova de universis philosophia*, and which he claimed represented the original Platonic philosophy of Aristotle before his thought had gone astray.⁵⁹ He gave it the title *Mystica Aegyptiorum [. . .] philosophia*, reflecting his belief that it contained the esoteric philosophy that Plato had learned through the books of Hermes Trismegistus during his studies under the Egyptian priests in Heliopolis.

Like Patrizi and Jessenius, Bureus’s conception of a sacred, enlivened universe was grounded in the Platonic notion of the World Soul, presented originally in the *Timaeus* and retroactively fleshed out in an increasingly Christian form by the Neoplatonic philosophers of the Renaissance. Among the first and most notable of these was Marsilio Ficino, who set himself the task of piecing together from the scattered fragments of ancient wisdom an all-encompassing ‘pious philosophy’ (*pia philosophia*) intended to eradicate the separation between philosophy and theology, and who accounted for the motion of the heavenly spheres in the *Theologia Platonica* as the effect of the desire (*appetitus*) of the soul.⁶⁰ It was the ‘new Platonism’ of late antiquity, funnelled through the even newer Platonism of the Renaissance, that Bureus believed could serve as the antidote to academic philosophy. It was a philosophy that laid emphasis on the power of intuition, inspiration, and imagination over Sophistic reasoning, which advocated an elitist institution of theological and philosophical instruction, and which distilled into a rich and potent elixir remarkably Christianized notions of the Creation and the immortality of the soul together with the theurgic principle that through rigorous study and mystical contemplation man

could ascend to a state of unity with God. A long tradition of Christian interpretation had transformed Platonic philosophy into a multifarious collection of luminous shards, which when pieced together in new configurations were capable of supplying precisely the sort of universal vista that many Renaissance scholars longed for.⁶¹

For his own part, Patrizi viewed the injection of *Anima* into his cosmological system as a much needed remedy to a disease that had come to afflict philosophical study in recent times:

In our day, men laugh at philosophers; and it is commonly said ‘So-and-so is a philosopher, he does not believe in God.’ The reason of this is, that the only philosophy is that of Aristotle, which, as men know and are told, denies the omnipotence and providence of God. Yet Hermes said *sine philosophia impossibile esse summe esse pium* [‘Without philosophy it is impossible to attain the greatest piety’].⁶² Reflecting on this saying, I thought that it might be possible to discover a truer philosophy, by which we might return to God who made us.⁶³

In the following, Patrizi placed his work squarely in the context of the Counter-Reformation, urging Pope Gregory to view his book as the basis of a universal Christian philosophy that should take the place of Aristotle in school curricula:

You will thus make all able men in Italy, Spain, and France friendly to the Church; and perhaps even the German Protestants will follow their example, and return to the Catholic faith. It is much easier to win them back in this way than to compel them by ecclesiastical censures or by secular arms.⁶⁴

The rhetoric of the dedication met with immediate success, and Patrizi was employed to teach Platonic philosophy at the Jesuit stronghold of the Sapienza University in Rome the following year. It was a short-lived victory, however, and after an unsuccessful attempt to defend his work from charges of heresy the book was banned by the Congregation of the Index in 1594.⁶⁵

It is one of the most conspicuous features of the late-Renaissance scholarly universe Bureus inhabited that militant Catholics and Protestants alike could draw on strikingly similar arguments to serve diametrically opposed confessional ends. In the *Zoroaster*, Jessenius retained Patrizi’s basic sentiment that a restored Zoroastrian-Hermetic natural philosophy could play a central role in the ongoing war of religious doctrine, but adapted it to conform with the specific Lutheran circumstances prevailing in Wittenberg in 1593.⁶⁶ In his dedication to Frederick William I, Duke of Saxe-Weimar, he stressed that his Trinitarian natural philosophy represented an attempt to recultivate the sprouts of ancient Egyptian and Oriental learning, which in the new age of doctrinal renewal should be planted and nurtured in the Saxon universities, the ‘delightful gardens of the whole of Germany’ (*universae Germaniae horti amoeni*).⁶⁷ What

was a picturesque metaphor for Jessenius was a coveted reality for Bureus. It was no mere coincidence that his earliest attempt to reform astronomy in 1595 coincided both with the rebirth of Uppsala University after seven decades of dormancy, and with Duke Charles's violent campaign to snuff out the final dying embers of Catholic sympathy in the realm. Bureus was on board with both of these projects. But unlike his Swedish contemporaries, including his patron, who was a warm-blooded enthusiast of all forms of cultural rehabilitation as long as they cost nothing, he disavowed that the establishment of a truly Reformed university was commensurate with sweeping the cobwebs out of the old lecture hall and blowing the dust off the old copies of the *Organon*. He envisioned a simultaneously new and ancient centre of education, part academy and part sanctuary, which took the form of a three-tiered garden complex, where students would begin at the lowest level by studying traditional liberal arts such as grammar and astronomy, after which time they would move up to the study of the esoteric arts of Cabala, alchemy, and natural magic, before finally ascending to the highest level where the sole subject was theosophy, the art of ascending into a union with God.⁶⁸

Astronomia rediviva

If the Padua-educated Patrizi had legitimate cause to point to a secular strain in the Aristotelian philosophy of his time, Bureus's similar view could hardly have been based on personal experience. The early-seventeenth-century proponents of Aristotelianism in Uppsala – among them Johannes Rudbeckius, father of the more famous Olof Rudbeck – had been schooled in respectable Lutheran strongholds such as Helmstedt and Wittenberg, where they had learned how to assimilate Peripatetic philosophy into the broader and more eclectic humanistic framework introduced through the educational reform of Melanchthon.⁶⁹ Indeed, Melanchthon had himself argued in an oration in praise of astronomy that the structure of the cosmos and the motion of the heavenly bodies could be read as an allegorical representation of certain doctrines of the Christian religion.⁷⁰ And more generally, the Philippist view of natural philosophy held that the study of the natural world complemented rather than opposed the study of scripture.⁷¹ Yet the path Bureus cut for himself through the tangled forest of early modern scholarship was in most cases more idiosyncratic than orthodox. He was an omnivorous reader, and although he was careful to keep a censorious eye trained on the theological content of his sources (the margins of his copies of several of Guillaume Postel's works are pockmarked with expletives directed at the French scholar's Papism),⁷² he tended to follow Cardano's precept in the *Arcana aeternitatis* that 'there is some falsehood in all truth, and some truth in all falsehood'.⁷³ He read and plucked learned titbits from some of the monumental works of Counter-Reformation scholarship, including Agostino Steuco's *De perenni philosophia* (1540) and Cesare Baronio's twelve-volume *Annales ecclesiastici* (1588–1607).⁷⁴ In a late work he attributed the discovery that the Sun rotates to Christian Scheiner's *Rosa ursina sive sol* (1626–1630), which

he viewed as the final corroboration of his own hypothesis that all heavenly bodies were endowed with movement.⁷⁵

Several decades earlier, he filled two pages with notes taken from the *In sphaeram Ioannis de Sacro Bosco commentarius* (first ed. 1570) composed by the rabidly anti-Copernican Jesuit mathematician Christopher Clavius.⁷⁶ Although Bureus's conception of the cosmos could not have been further removed from that of Clavius, he was in agreement with his Jesuit adversary that the study of astronomy was not something removed from the sphere of theological doctrine, but rather that 'astronomy is necessary for church officials' (*Astronomia necessaria est personis ecclesiasticis*), as Clavius put it in the course of a discussion on 'the utility of astronomy for theology' (*Astronomiae utilitas ad Theologiam*).⁷⁷ What interested Bureus in the book was not the astronomical theories it contained, but rather its attempt to situate the discipline of astronomy within the purview of sacred history. Clavius began with an overview of the history of the discipline, where he held that astronomy was the noblest and most ancient of all the sciences, having existed not only prior to the Flood, but from the very commencement of the world.⁷⁸ Adam had prophesized to his children that the world would be destroyed on two occasions, once by fire and again by flood, and fearing that their knowledge of celestial things (*disciplina rerum coelestium*) would be lost to mankind, they erected two columns, one of brick and the other of stone, which they inscribed with their astronomical knowledge for the benefit of future generations.⁷⁹

This account appears to have had a great impact on Bureus. Not because he was unaware of the story of the columns, which Clavius had taken from Josephus's *Jewish Antiquities*: indeed, he had earlier drawn on the same story in Josephus during a discussion of the history of writing in the unpublished draft of his earliest monograph on the runic script.⁸⁰ Rather, it was the scientific context in which Clavius placed the account that set his mind in motion. At the beginning of time, Bureus concluded, the histories of science and writing were one and the same. The most ancient system of writing had encapsulated the primordial science in its very form. Yet for all his genuine interest in astronomy, he could not agree with Clavius that the original wisdom inscribed on the columns was identical with astronomy conceived as one discipline among others. For Bureus, the Belgian Paracelsian Gerhard Dorn had come much closer to the truth in his revised account of the columns in the *Congeries Paracelsicae chemiae* (1581), the version of the story that Bureus would return to throughout his career, and which he appears to have transcribed for the first time immediately following his reading of Clavius.⁸¹ In Dorn's version, the knowledge that had been inscribed on the columns in 'hieroglyphic letters' was not the discipline of astronomy, but rather an amalgam of 'all the natural arts', the universal wisdom that had been transferred to Adam by God through a ray of light, and which had been gradually fragmented and diluted over the course of human history, so that 'one man became an astronomer, another a magus, another a cabalist, and a fourth an alchemist'. And where Josephus and Clavius left a tantalising loose thread by asserting that one of the columns remained standing

somewhere in Syria, Dorn tied the story together by relating that Noah had discovered it at the base of Mount Ararat after the Flood. As Håkan Håkansson has noted, Noah's discovery provided the necessary missing link that allowed Bureus to begin to think seriously about the survival of the Adamic wisdom in the postdiluvian world.⁸² Almost immediately he began to work with the hypothesis that the script used on the column was identical with the Swedish runes, and that the universal wisdom it incorporated was nothing other than the 'hieroglyphic science' (*doctrina hieroglyphica*) of the earliest Uppsalian sages.⁸³

If Bureus's retrospective assertion that he had independently struck upon some of the most radical breakthroughs of Renaissance astronomy smells of sour grapes, it is important to stress that he viewed his *inventio* both as a novelty and as a specimen of *renovatio*. It was a kind of double anachronism that reflected a friction between the contrary pulls of the criteria of innovation and authority, a tension that gradually intensified over the course of the long Renaissance. Yet to the extent that a battle line had already begun to appear between the camps of the ancients and the moderns by the turn of the seventeenth century, it remained far more indeterminate, pliant, and permeable than it would become during the famous *Querelle* that erupted a century later.⁸⁴ In few fields of inquiry were the reverberations of this collision between the old and the new felt more palpably than in astronomy, where practitioners were compelled to consider the spiritual and intellectual consequences of a break with tradition that was more than hypothetical, despite the fact that a number of conservative voices – including the Nuremberg reformer Andreas Osiander, who penned the anonymous address to the reader that prefaced the first edition of the *De revolutionibus* – framed dissident theories as hypotheses precisely in order to circumvent reflection on the consequences. Even a champion of the modern as ardent as Johannes Kepler, who scorned appeals to ancient authority that stood in the way of new discoveries, and who dismissed Patrizi's pious natural philosophy as the confused composition of a man who 'philosophises in such a way that one who paid heed to him could not move a foot without granting that a miracle occurred',⁸⁵ could nevertheless display a striking degree of indecision when it came to his own scientific endeavours, describing his work on cometary theory, for example, as 'creating new doctrines, or rather recovering the old ones of Anaxagoras and Democritus'.⁸⁶ Bureus's retrospective description of his earliest astronomical discovery displayed the same ambivalence. It was an original invention intended to give a systematic explanation to an observable phenomenon, yet whose ultimate meaning was provided by a line from the day's Gospel reading: 'Rejoice with me; for I have found the piece which I had lost'.⁸⁷

Bureus viewed the astronomical restoration projects of his predecessors and contemporaries against the backdrop of his own ongoing enterprise to revive the ancient wisdom that had been cultivated by the earliest Swedish inhabitants. The idea itself was of course hardly a new one. Astronomy was among the disciplines that according to Johannes Magnus had been taught to the ancient inhabitants of Sweden by the philosopher Deceneus, who had himself been

instructed in ‘the schools of the Greeks (or as others would have it) the Egyptians’.⁸⁸ Yet Bureus went much further than Johannes by stressing that Sweden had not been a mere beneficiary of the knowledge developed by other ancient societies, but had in fact served as an ancient centre for the dissemination of wisdom. In an unpublished treatise on the ‘Theologia Suetica Primitiva’ he portrayed the ancient inhabitants of Sweden as the chosen people who were among the first to be presented with God’s universal wisdom, deliberately and daringly quoting the last verse of Psalm 147 out of context so that the claim that God had not revealed his Word to any other nation referred not to Israel, but to Sweden.⁸⁹ The ‘preeminent mysteries’ had found an early home in Uppsala, from where they were gradually ‘divulged over the course of successive centuries through Gothia⁹⁰ into Denmark, Norway, and the other nations’.⁹¹ There is no space here to give an overview of the genealogical acrobatics Bureus performed in his notebooks and working drafts in order to attach a Swedish pedigree to a number of the famous sages of antiquity, among them the Getic Zalmoxis, the Hyperborean Abaris, the Thracian Orpheus, and even the Egyptian Hermes. Toward the end of his career, he became convinced that he had correctly identified the patriarch of the Swedish people as the Bactrian king Zoroaster, whom he claimed had led the first group of settlers to the Swedish peninsula after his defeat to the Assyrian king Ninus in the time of Abraham.⁹² Like many of his contemporaries, Bureus held that these early sages were the exponents of a proleptic form of Christian theology; but he went much further than most in arguing that this *prisca sapientia* represented a purer and more authentic form of the Christian religion than Christianity proper. Thus the assertion of Ficino and others that Zoroaster was the first of the sages, he ‘from whom emanates all the wisdom of the ancient theologians’, was viewed by Bureus as testimony corroborating the unblemished piety of his ‘pagan’ ancestors.⁹³

Among the ideas that Bureus took from the apocryphal writings attributed to Zoroaster and other *prisci theologi* was the notion that the structure of the universe, the *macrocosmos*, was recapitulated in the makeup of man conceived as *microcosmos*. It was an idea that he honed through his early readings of Johann Reuchlin and Pico della Mirandola, who in the *Heptaplus* held that ‘man is a small world’ (*homo est parvus mundus*) and ‘the world is a great man’ (*mundus est magnus homo*), and that the tripartite composition of the cosmos (intellectual/angelical, celestial, and material) was reflected in the form of man.⁹⁴ Soon he would discover further elaborations of the idea in Paracelsus, Gerhard Dorn, Jacques Gohory, Helisaeus Roeslin, and others, before encountering it in what he considered to be its consummate expression in Heinrich Khunrath’s dreamily suggestive *Amphitheatrum sapientiae aeternae*.⁹⁵ Yet it was Roeslin in particular who placed the macrocosm/microcosm relation in the context of the ongoing astronomical revolution in the *De opere Dei creationis* (1597), a work claiming to contain the ‘preeminent foundations of the old and new philosophy’ (*praecipua fundamenta Philosophiae et veteris et novae*), where he stressed the correspondence between the tripartite compositions of the cosmos and man: From the ‘Angeli- cal world’ man receives mind, reason, and intellect; from the ‘ethereal world’,

soul; and from the ‘elemental world’, body.⁹⁶ To highlight that the book represented a synthesis of the newest and the most ancient philosophy, he opened it with a cosmological emblem professing to be the ‘Pythagorean Seal of the World’, and concluded it with a diagram of his own geoheliocentric model of the cosmos, which was nearly identical to Tycho’s, and which he claimed he had conceived by means of divine revelation prior to having become acquainted with Tycho’s work.⁹⁷ The chronically excitable Ursus, whose world system Roeslin accused of contradicting Scripture, was enraged by the book, claiming that the author had lifted his world system from Tycho ‘like an ape aping an ape’, and was at bottom so inept in the technical aspects of astronomy that he cackled ‘like a goose among swans’.⁹⁸ Bureus undoubtedly took the side of Ursus when it came to Roeslin’s rejection of the hypothesis of a rotating Earth on scriptural grounds.⁹⁹ Yet as in the case of his reading of Clavius, he was able to winnow out the chaff in order to expose the serviceable grain. He appears to have been particularly drawn to Roeslin’s attempt to synthesise the Piconian idea of a triple world with the Paracelsian theory of the three principles (mercury, sulphur, and salt), which in turn found ‘analogies’ in the triad of Spirit, Soul, and Body expounded ‘by Hermes Trismegistus, that most ancient of philosophers’.¹⁰⁰ Despite Roeslin’s mistaken vindication of a finite universe and a stationary Earth, as well as his wayward attempts to squeeze Aristotelian physics into a Platonic framework, Bureus saw in his conception of a ‘Trinity in nature’ an important attempt to ‘correct the hypotheses of Tycho’.¹⁰¹

Although Bureus did not explain which of Tycho’s hypotheses he believed Roeslin had corrected, the context suggests that he felt that Roeslin’s attempt to establish the interconnectedness of the cosmos through a series of symmetrical triads emanating from the divine Trinity down to man, functioned as a necessary antidote to Tycho’s retention of the Aristotelian dualism between the celestial and sublunary spheres through his preservation of the concept of quintessential ether, the element whose presence underlay the circular movement of the heavenly bodies, and whose absence explained the stationary condition of the Earth.¹⁰² Adam Mosley has pointed out that while Tycho’s arguments against Copernicanism were in no small part theological, they were not exegetical.¹⁰³ For Bureus, this is precisely where his Danish predecessor had got it wrong. A true understanding of the universe could only be attained through a combination of the careful observation of visual phenomena and the conscientious exegesis of ancient texts, both those of the ‘pagan’ *prisci theologi* and Moses himself. As his career rolled on, inspired by his early readings of Pico’s *Heptaplus* and his later textual encounters with Francisco Vallés, Johann Heinrich Alsted, and Johann Amos Comenius, he increasingly came to conceive of his cosmological deliberations in the terms of a ‘Mosaic Physics’ grounded on a close reading of the Hebrew text of Genesis. Although his most extended discussion of this Mosaic natural philosophy is found in the preface to an unfinished treatise on the history of language and writing systems composed in the early 1630s,¹⁰⁴ he attempted to summarise his position roughly a decade later in a broadside that he described as a ‘synopsis’ of the ‘Most Ancient Philosophy of

the Hebrews’, a work ‘intended solely for the seekers of truth’, and composed by ‘the most learned Student of Antiquities, the Swede Johannes T.A. Bureus, on the 26,944th day of his life’ (Fig. 11.4).¹⁰⁵

Leaving the details of his Mosaic philosophy aside, the sheet is notable for being the only page on natural philosophy Bureus ever saw to the press, and the first time a Swede stated his allegiance to the Copernican system in print. Yet in contrast with a number of the other Mosaic philosophers of the sixteenth and seventeenth centuries, who argued that the creation account in Genesis was the only legitimate textual source for knowledge concerning the structure of the cosmos, Bureus continued to hold that the wisdom of the Hebrew patriarchs was commensurate with the ancient Swedish ‘science of the universe’ (*Sveorum . . . universi scientia*).¹⁰⁶ And in a move that crossed the dividing line between theological idiosyncrasy and heresy, he argued that a correct understanding of the structure of the cosmos, rather than belief in the historical incarnation of Christ, was the true fundament of the Christian faith. ‘Jew, Turk, and Pagan’, he noted directly above his depiction of the Copernican system, in what reads as a conscious echo of the ecumenical apocalypticism of Postel, ‘if they were to come to recognize [the structure of the universe] figuratively, who will doubt them to be Christians?’¹⁰⁷ Playing on the homonymic relation between the ancient Swedish words for ‘sun’ and ‘son’, he argued that the position of

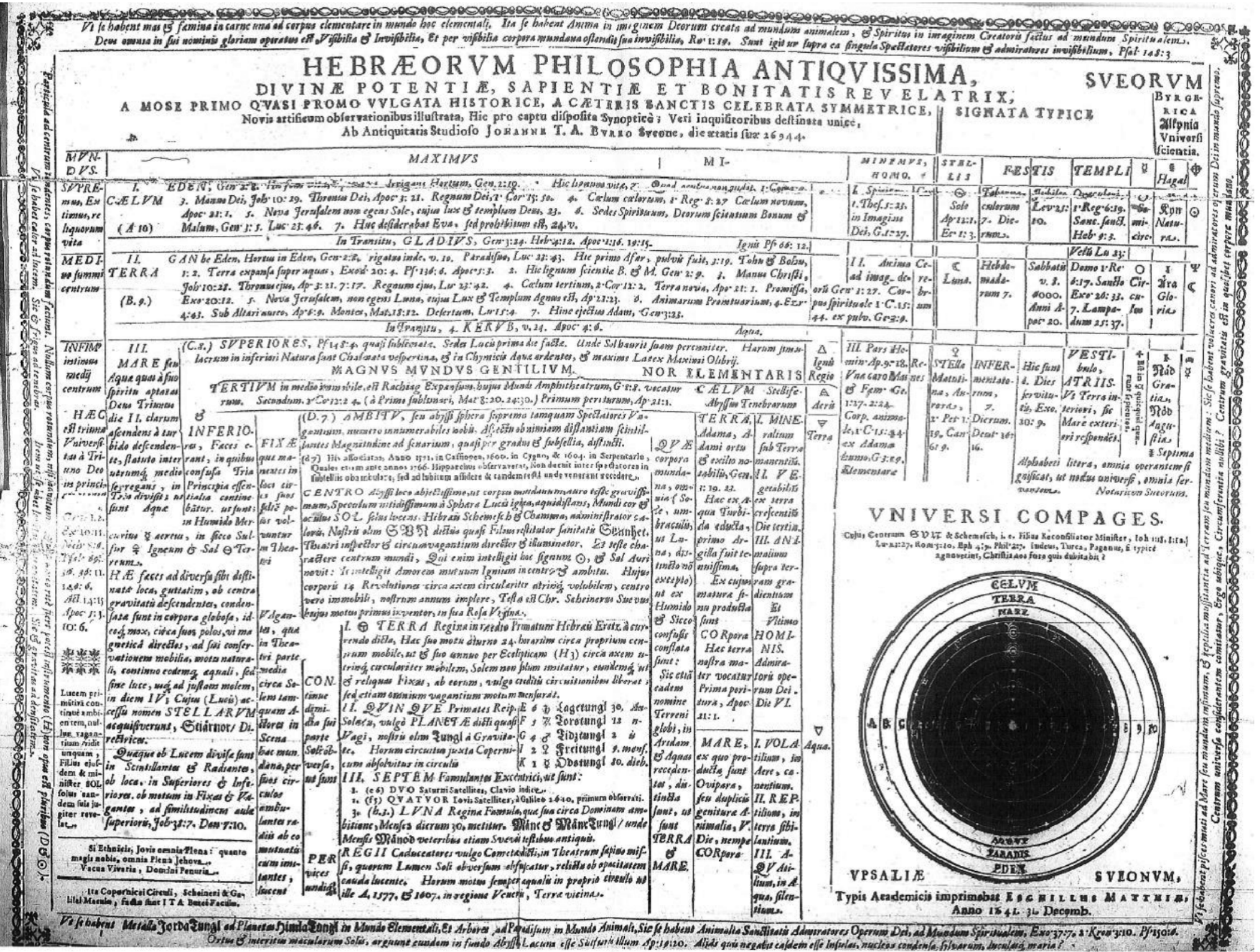


Figure 11.4 *Hebraeorum philosophia antiquissima* (Uppsala, 1641). Courtesy of the National Library of Sweden.

the sun (*Sun*) in the structure of the cosmos was equivalent to the role that had been accorded to the Son (*Sun*, i.e. Christ) in sacred history. The revealed religion of Christianity had in fact already been revealed through God's creation of the universe as a *mundus symbolicus* in which the central placement of the sun signified, in the form of a natural hieroglyph or signature, the role of Christ as the 'mediator' and 'arbiter' (*internuncius*) between the realms of divinity and humanity.¹⁰⁸ And just as the Son had descended to Earth as the 'restorer of health' (*restitutor sanitatis*), the rehabilitator of both physical and spiritual well-being (*sundhet*), the Sun played a central role in the work of salvation (*sun* or *sona*, meaning to 'save' or 'redeem') through its function as the 'conductor of warmth' (*administrator caloris*), an idea Bureus based on the earlier assertions of Ficino, Cardano, and others that the natural form of the World Soul was celestial heat.¹⁰⁹ In this manner, the new understanding of the structure of the universe, realised through the observations and computations of forward-looking men such as Copernicus, Galileo, and Scheiner, revealed itself to be an important facet of the *philosophia antiquissima* of the first men. Despite his own genuine engagement with the great system war that had been waged over the course of the preceding century, the seventy-three-year-old antiquary recognised in the end that his own role had been that of an integrator rather than an innovator, for it was he alone who had succeeded in restoring the various astronomical breakthroughs of his age to their original sacred setting:

If for the pagans everything was filled with Jove, how much greater it is for us that everything is filled with Jehovah. Pens empty of livestock are desolate of the Lord. / And so the orbits of Copernicus and the dark spots of Galileo and Scheiner have become the bright spots of I.T.A. Bureus.¹¹⁰

Bureus's lifelong attempt to recover the lost *prisca astronomia* ran conterminously with his attempt to restore the true form of the primordial Church. The knowledge of the heavenly bodies and their movements was not a secular discipline that had developed from lines of inquiry separate from theological concerns, a discipline whose contemporary inheritors were the quack doctors and myopic mathematicians who filled the academies of Europe. Rather, it had been an integral component of the spiritual beliefs and practices of the Swedish people from the earliest times, and what would later emerge as the science of astronomy was from the beginning one of the most central operations of the office of the priest, the *Tidman* (constructed from the old Swedish word *Tidhr*, signifying both 'religious worship' and 'time'), whose duties included keeping track of the holy days on the runic calendar through the careful and informed observation of the movements of the stars and planets.¹¹¹ Bureus's curious insistence that the index arm of his newly designed 'duodecant' should be inscribed with the ancient runic calendar was therefore much more than an attempt to supply a technological novelty with antiquarian cachet. He viewed his invention of the instrument as the renovation of a liturgical implement that would come to serve a key function in the sacred rites of a newly reformed Church,

not Luther's reformed church, but the final *Ecclesia rediviva* whose appearance on the world stage would precipitate the Golden Age preceding the Last Judgment and the end of time. It was a Church whose imaginary archetype was the most ancient forms of worship practiced in Uppsala near the beginning of human history, whose sacred script was the Swedish runes, and whose divinely ordained *restaurator* was Bureus himself.

Notes

My thanks to the faculty of the Department of the History of Ideas and Science at Gothenburg University for their valuable comments and suggestions on an early draft of this chapter.

- 1 See Bureus's journal entry for 7 April 1590. Unless otherwise noted, all references to Bureus's journal entries refer to the collection edited by G. E. Klemming in *Sammlaren: Tidskrift utgifven av Svenska litteratursällskapetets arbetsutskott* 4 (1883), 12–43, 71–126. On the dormancy and reinstitution of Uppsala University and the short-lived Collegium regium Stockholmense, see Claes Annerstedt, *Upsala universitets historia*, vol. 1 (Uppsala, 1877), 51–101.
- 2 On the political and religious disputes in Sweden in the late sixteenth and early seventeenth centuries, see for example Lars-Olof Larsson, *Arvet efter Gustav Vasa: En berättelse om fyra kungar och ett rike* (Stockholm, 2005); Erik Petersson, *Den skoningslöse: En biografi över Karl IX* (Stockholm, 2008).
- 3 Journal entry for 11 April 1603 and the final (undated) entry for 1603. Several of Bureus's drafts of 'hieroglyphic' epitaphs and epithalamia – where he applies a form of rebus writing – survive in Stockholm, Kungliga biblioteket (hereafter: KB) MS F.a. 11; see for example fols. 57r and 61r.
- 4 Bureus's notes on cipher scripts are spread throughout KB MS F.a. 11; see for example fols. 34v–35r.
- 5 KB MS F.a. 10:2, fol. 62r. The rune stone (U 54) in the Franciscan monastery church, which has since been lost, is discussed in Elias Wessén and Sven B. F. Jansson, *Upplands runinskrifter första delen* (Uppsala, 1943), 72–74. The best overviews of Bureus's epigraphical research remain Henrik Schück, *Kgl. vitterhets historie och antikvitetsakademien: Dess förhistoria och historia*, vol. 1 (Uppsala, 1932), 40–63; and Elisabeth Svärdström, *Johannes Bureus' arbeten om svenska runinskrifter* (Stockholm, 1936).
- 6 Bureus's notes from his journey through the northern provinces in 1600–1601 are strewn throughout KB MS F.a. 12. Extracts have been published in G. E. Klemming (ed.), *Sumlen: där uthi ähro åtskillighe collectaneer, som uthi een och annan måtta tiäna till antiquiteternes excolerande* (Stockholm, 1886). For his description of Lapp mothers, see KB MS F.a. 12, fol. 422r.
- 7 Journal entries for 9, 10, and 11 March 1603. His depiction of the 'giant grave' (*jättegriфт*), actually a stone ship setting, is found in KB MS F.a. 12, fol. 801r. Cf. Ola W. Jensen, *Forn-tid i historien* (Diss, 2002), 201.
- 8 It is of interest to note that the next Swede to openly defend the Copernican cosmos was Olof Rudbeck, who like Bureus carried out antiquarian studies against the backdrop of an encyclopaedic vision. See Sten Lindroth, *Svensk lärdomshistoria*, vol. 2 (Stockholm, 1975), 498; and Gunnar Eriksson, *Rudbeck 1630–1702: Liv, lärdom, dröm i barockens Sverige* (Stockholm, 2002), 227–241. For an overview of the early reception of Copernicus in Sweden, see See Henrik Sandblad, 'Det copernikanska världssystemet i Sverige, I', *Lychnos* (1943), 149–188.
- 9 'Johannes Kepler: The New Astronomer Reads Ancient Texts', in Anthony Grafton et al. (eds.), *Commerce with the Classics: Ancient Books and Renaissance Readers* (Ann Arbor, 1997), 188–189.

- 10 LSB MS Spr. 1, fol. 1r–v.
- 11 LSB MS N 24, fol. 61v: ‘Mitt certitudo instrumentis rationis, autoritatis et exp[er]ientiae mittitur.’
- 12 KB MS Fa. 2, fol. 7v: ‘1595. 6 July 3 antemer. (sama dagh som Evangel. lyder glediäns medh migh iagh hafer funit min Pening) fan iagh af migh siälf, motum ♀ och ♂ verum vara circum ☉ (förr än iagh sågh Theorias Planetaru.) och hwi de synes gå tillbaka.’ The parenthetical reference is to Luke 15:9: ‘And when she hath found it, she calleth her friends and her neighbours together, saying, Rejoice with me; for I have found the piece which I had lost.’
- 13 For an overview in English of the literary feud between Swedish and Danish scholars in the field of historiography, see Karen Skovgaard-Petersen, ‘Political Polemics in Early Modern Scandinavia’, in Anne Eriksen and Jón Viðar Sigurðsson (eds.), *Negotiating Pasts in the Nordic Countries: Interdisciplinary Studies in History and Memory* (Lund, 2009), 79–98.
- 14 Namely, the broadsheet entitled *Runakenslanes Läraspån* (dated 1599; first published in Uppsala, 1600), often referred to as the ‘Runic Table’ (*Runtavlan*), where Bureus contended that the ancient Danes had inherited the runic alphabet from the Swedes, and that the then Danish territories of Skåne (Scania), Halland, Blekinge, Jämtland, and Gotland were all the rightful possessions of Sweden.
- 15 Sandblad, ‘Det Copernikanska världssystemet i Sverige,’ 157 n. 7. Robert S. Westman, *The Copernican Question: Prognostication, Skepticism, and Celestial Order* (Berkeley, 2011), 270.
- 16 KB MS Fa. 2, fol. 1 r. The heading of the list reads: ‘Libri vel authores utilissimi.’
- 17 On Melanchthon and the ‘Wittenberg interpretation’ of the Copernican theory in general, see Robert S. Westman, ‘The Melanchthon Circle, Rheticus, and the Wittenberg Interpretation of the Copernican Theory,’ *Isis* 66, no. 2 (1975), 164–193, esp. 173–174. On Tycho, see Westman, ‘Three Responses to the Copernican Theory: Johannes Praetorius, Tycho Brahe, and Michael Maestlin’, in Westman (ed.), *The Copernican Achievement* (Berkeley and Los Angeles, 1975), 285–345. See also Adam Mosley, *Bearing the Heavens: Tycho Brahe and the Astronomical Community of the Late Sixteenth Century* (Cambridge, 2007), 96–97.
- 18 KB MS Fa. 11, fol. 18v: ‘Stellas fixas (at parum p[ro]p[ter] max[imum] distantiam) non dimoveri e loco quia corpora flammantia. Si moverentur (et praesertim motu tam citatissimo) certe projicerent post se flammam caudatam. At planetae qia non flammant sed reverberant radios solis, nullam caudam habent. Illud etiam posse statui de motu terræ Coperniceo et solis quiete. lectori relinquo’.
- 19 KB MS Fa. 11, fol. 19r.
- 20 Nicholas Jardine, *The Birth of History and Philosophy of Science: Kepler’s a Defence of Tycho Against Ursus with Essays on Its Provenance and Significance* (Cambridge, 1984), passim.
- 21 Ursus qtd. and trans. in Jardine, *The Birth of History and Philosophy of Science*, 35.
- 22 KB MS Fa. 2, fol. 1r. The section in the *Tractatus* on the history of astronomical hypotheses has been translated by Jardine, *The Birth of History and Philosophy of Science*, 47–57.
- 23 Emil Svagr, ‘Johannes Jessenius a Jessen,’ *Medical History* 7, no. 1 (January 1963), 74–75. A moving account of the executions is found in J. E. Hutton, *A History of the Moravian Church*, 2nd ed. (London, 1909), 150.
- 24 His personal copy (Linköping stiftsbibliotek [hereafter: LSB], Rara R1429) contains a handwritten dedication to his friend Laurentius Olai Luth dated one month earlier (9 June 1595). On the title page: ‘Suo amico et fratri carissimo Adolescenti ingenuo D. Laurentio O. Luth Johannes Th. Bureus Agrivillensis d. d. d. A. C. 1595. 9. Junii.’ It appears that Bureus had given the book to Luth only to have it returned at a later date, as he appended fifty-seven pages of notes on the figure of Zoroaster (now separated as LSB MS N 26) to the book at some time in the 1620s. Yet the marginal notes in the text itself, as Sten Lindroth pointed out on paleographical grounds, almost certainly date from Bureus’s original reading some time prior to June 1595. See Lindroth, *Paracelsismen*, 184, n. 1.

- 25 A summary of several of the themes treated by Jessenius in the *Zoroaster* can be found in Robin B. Barnes, 'The *Prisca Theologia* and Lutheran Confessional Identity c. 1600: Johannes Jessen and His *Zoroaster*', in Martin Mulsow (ed.), *Spätrenaissance-Philosophie in Deutschland 1570–1650: Entwürfe zwischen Humanismus und Konfessionalisierung, okkulten Traditionen und Schulmetaphysik* (Tübingen, 2009), 43–56.
- 26 Jessenius, *Zoroaster*, 46. Patrizi, *Nova de universis philosophia* (Ferrara, 1591), fol. 103r–v. Cf. Zdeněk Horský, 'Le rôle du platonisme dans l'origine de la cosmologie moderne,' *Organon* 4 (1967), 51.
- 27 Jessenius, *Zoroaster*, 42: 'Terram vero ad universi medium ferri falsum. Supra hoc enim constitit, circaque hoc veluti polum, qualiter rotari Coelum putatum, vertitur.' On Patrizi, see Paolo Rossi, 'Francesco Patrizi: Heavenly Spheres and Flocks of Cranes', in Maria Luisa Dalla Chiara (ed.), *Italian Studies in the Philosophy of Science* (Dordrecht: D. Reidel, 1981), 378.
- 28 KB MS Fa. 2, fol. 54r: 'Nullum certum mundi Centrum posse determinari.'
- 29 KB MS Fa. 2, fol. 54v: 'Mundus tam capax, cujus centrum ubiq. et circumferentia nullibi.'
- 30 *De docta ignorantia* 11.11. Cf. Lindroth, *Paracelsismen*, 90–91.
- 31 KB MS Fa. 11, fol. 18v: 'Solem in loco stare. motus planetarum juxta ecclipticam, convincit.' His cosmological diagram is strikingly similar to the one published by Thomas Digges at the beginning of his English translation of sections of book one of Copernicus's *De revolutionibus*, entitled *A Perfit Description of the Caelestiall Orbes according to the most aunciente doctrine of the Pythagoreans, latelye reuiued by Copernicus and by Geometricall Demonstrations approued*, and included as an appendix to Leonard Digges, *A Prognostication Everlasting of Right Good Effecte* [etc.] (London, 1576). Although the work was published in six editions by 1605, it is unlikely that one of these small-run English vernacular publications found their way into the hands of Bureus, who in any event would have been unable to read them. On Digges's infinitism and Copernican diagram, see Francis R. Johnson, 'Thomas Digges, the Copernican System, and the Idea of the Infinity of the Universe in 1576,' *The Huntington Library Bulletin* 5, (1934), 69–117. See also Westman, *The Copernican Question*, 268–280.
- 32 KB MS Fa. 2, fol. 54r.
- 33 *De docta ignorantia* 11.11.
- 34 KB MS Fa. 11, fol. 18v: 'Stellas fixas moveri in loco (quaelibet circa suos proprios polos et centrum) verisimillimum est, propter patefactionem operum Dei, quo ad motum mundanorum corporum ne tam multa et tam magna corpora quae nondum in cognitionem nostram venerant, relinquuntur otiosa et vana suis habitatorib. (antea inventa a me sunt). Omnia corpora caelestia inhabitatoribus repleta esse ideo statuo, quod cum terra, quae vilissima putatur, minime vacua habitatoribus sit, Certe nobiliora istis non destituuntur'.
- 35 Cf. Lewis White Beck, 'Extraterrestrial Intelligent Life', in Edward Regis Jr. (ed.), *Extraterrestrials: Science and Alien Intelligence* (Cambridge, 1985), 4–5.
- 36 Cf. Dennis Danielson, 'Early Modern ET, Reflexive Telescopes, and their Relevance Today', in Douglas A. Vakoch (ed.), *Astrobiology, History, and Society: Life beyond Earth and the Impact of Discovery* (Heidelberg: Springer, 2013), 62. See also A. O. Lovejoy, *The Great Chain of Being* (Cambridge, 2001) (first pub. 1936), 115–116.
- 37 Lovejoy, *The Great Chain of Being*, 116.
- 38 Cf. Steven J. Dick, *Plurality of Worlds: The Origins of the Extraterrestrial Life Debate from Democritus to Kant* (Cambridge, 1982), 63–69.
- 39 *De docta ignorantia* 12.12.
- 40 For an overview and discussion of Cusanus's arguments, see Alexandre Koyré, *From the Closed World to the Infinite Universe* (Baltimore, 1957), 19–23. For a discussion of Bureus's notion of a cosmic hierarchy, see Lindroth, *Paracelsismen*, 190–216.
- 41 KB MS Fa. 2, fol. 8r.
- 42 KB MS Fa. 2, fol. 65r: 'Till minnes (om Gudh Will jagh skall skrifva Astronomiam på Swensko)'.

- 43 KB MS Fa. 2, fol. 54r: 'Instrumentum commodissimum Mate Tolftung, duodecima pars circuli, 1/3 quadrantis, att mäta Elevationes til 90 gradus per trinas dioptras, och distantias Stellarum til 30 grad'.
- 44 Journal entry for 22 March 1606: '9 1/2 ant. invention'.
- 45 Journal entries for 3 March and 15 July 1602. Cf. Martin Kjellgren, *Taming the Prophets: Astrology, Orthodoxy, and the Word of God in Early Modern Sweden* (Lund, 2011), 192–193.
- 46 Journal entry for 3 March 1602: 'fik iagh igen quadranten aff giutaren för 8 dl. (som Jören Clasons och Johansons sedel lydde) den iagh sedhan skar i tu til quadrant och astrolabium'.
- 47 Paul Richard Blum, *Studies on Early Modern Aristotelianism* (Leiden, 2012), 15–16. Ian Hunter, 'The University Philosopher in Early Modern Germany', in Conal Condren et al. (eds.), *The Philosopher in Early Modern Europe: The Nature of a Contested Identity* (Cambridge, 2006), 44–45. On positive Lutheran theological responses to Copernicus, see for example Peter Barker, 'The Role of Religion in the Lutheran Response to Copernicus', in Margaret J. Osler (ed.), *Rethinking the Scientific Revolution* (Cambridge, 2000), 59–88.
- 48 Journal entry for 12 October 1600.
- 49 Journal entry for 13 March 1617.
- 50 Journal entry for 26 December 1620, qtd. in Hildebrand, *Minne af riksantikvarien Johannes Bureus*, 102.
- 51 Journal entry for 24 July 1619.
- 52 KB MS Fa. 12, fol. 142r.
- 53 On Ramism in Sweden, see Sten Lindroth, *Svensk lärdomshistoria*, vol. 1 (Stockholm, 1975), 317–325. See also Jenny Ingemarsdotter, *Ramism, Rhetoric, and Reform: An Intellectual Biography of Johan Skytte (1577–1645)* (Dissertation, Uppsala universitet, 2011), passim.
- 54 LSB MS N 24, fol. 12r.
- 55 KB MS Fa. 9, unpag. [34]. It is not unlikely that Bureus's use of the term 'Sacred Philosophy' (*Philosophia Sacra*) in this note echoed Francisco Vallés' *De iis, quae scripta sunt physice in libris sacris, sive de sacra philosophia* (Turin, 1587), which he read around the same time. Cf. LSB MS N 26, 12, 15. For a discussion of Vallés' work, see Kathleen M. Crowther, 'Sacred Philosophy, Secular Theology: The Mosaic Physics of Levinus Lemnius (1505–1568) and Francisco Valles (1524–1592)', in Jitse M. van der Meer and Scott Mandelbrote (eds.), *Nature and Scripture in the Abrahamic Religions: Up to 1700* vol. 1 (Leiden, 2008), 412–438.
- 56 Cf. *Zoroaster*, 17: 'Natura enim aliud nihil est, quam una totius mundi vita ab anima pendens ut a causa, cuius actus vivendi facta particeps, et mundi corpus movet, et in statu retinet. Anima tanquam sua causa a Mente id habet quod naturae tribuit: Mens hoc quod animae largitur a vita obtinet, cuius mens effecta: Vita vero id ipsum a sua essentia nacta: Essentia tandem a naturae Idea, atque prima eius unitate quae flos atque fons ipsius naturae est'.
- 57 Patrizi, *Nova de universis philosophia* (Ferrara, 1591), fol. 105v col. b: 'Planetae quidem appellati sunt, atque errone, quoniam et citra, et ultra eclipticam, solisque viam, variis meant motibus. Modo enim a solis orbita ad septentriones, modo ad meridiem defleunt . . . Nostro equidem arbitrio, et errore errant, eorum vero culpa nulla. Neque enim natura eorum errare potest. Est enim animi proles, animi inquam rationalis, et intellectu praediti, quorum neutrum in coelesti regione, errare potest. Neque propria culpa, neque corporis quod animat coelestis, et uti Plato et Aristoteles dicerunt, divini. Suntque non uti Astronomorum, et philosophorum plerumque vulgus existimavit, corpora inanima. Sed sunt, ut vere eos appellavit Zoroaster, et post eum Plato, et Aristoteles, animalia.' Trans. by Nicholas Jardine, *The Birth of History and Philosophy of Science*, 235.
- 58 Luc Deitz, "'Falsissima Est Ergo Haec de Triplici Substantia Aristotelis Doctrina.'" A Sixteenth-Century Critic of Aristotle: Francesco Patrizi da Cherso on Privation, Form, and Matter, *Early Science and Medicine* 2, no. 3 (1997), 227–250.
- 59 See P. O. Kristeller, *Eight Philosophers of the Italian Renaissance* (Stanford, 1964), 115.

- 60 Cf. Jörg Lauster, 'Marsilio Ficino as a Christian Thinker: Theological Aspects of His Platonism', in Michael J. B. Allen and Valery Rees (eds.), *Marsilio Ficino: His Theology, His Philosophy, His Legacy* (Leiden, 2002), 45–69. On the motion of the heavenly spheres, see *Theologia Platonica* 4.2.
- 61 For an overview of Renaissance Neoplatonism, see Brian Copenhaver and Charles Schmitt, *Renaissance Philosophy* (Oxford, 1992), Chapter 3.
- 62 Patrizi quoting Stobaeus, *Excerpts* IIB.
- 63 I quote Walter Scott's gloss translation of Patrizi's dedication of the *Nova de universis philosophia* to Pope Gregory XIV in *Hermetica*, vol. 1 (Oxford, 1924), 38. The cited passage reads in the original (Ferrara, 1591, unpag. [sig. a 2 ff.]): 'Vulgi, et litteratorum etiam multorum animis insedit, plerosque eorum qui philosophiae operam navant, de fide catholica, non bene, non pie sentire, et aut non recte, aut nihil credere, ridentque passim philosophos, hoc dicterio, iam vulgato, hic philosophus est in Deum non credit. Neque id sane temere. Vident enim in omnibus Europae gymnasiis, in omnibus monachorum coenobiis, solam Aristotelis philosophiam, magnis praemiis, et magna cum ambitione doceri. Hanc autem solam (Nam Epicurea, quae in Lucretio vix superest, fere ignota iacet) Deo et omnipotentiam, et providentiam auferre, et sciunt, et audiunt. Quid igitur de eius cultoribus, et propugnatoribus concipiant? aut quas meliores de eis imbibant opiniones?' 'Ego vero haec olim considerans, simulque illud sapientissimi Trismegisti dictum, mente saepius revolvens, Sine philosophia impossibile esse summe esse pium. Vehementem enim, subdit, amorem habet, et malorum omnium obliviscitur, ea anima quae suum didicerit authorem. Nam a bono discedere amplius non potest. Et Deo facta similis, vel pura sit mens, vel Deus evadit; aliam quam Peripateticam, veriore in rebus reperiri posse philosophiam suspicatus sum.'
- Cf. Jessenius, *Zoroaster*, sig. A 2r–v: 'Hinc vulgus, et nonnulli literatorum, dum vident Philosophiae plerosque deditos, de religione non bene, non pie sentire, aut recte, aut nihil credere, vulgato hoc, hic Philosophus est, in Deum non credit, omnes rident Philosophos dicterio.' It is worth noting that Jessenius named Averroes rather than Aristotle himself as the source of the godless philosophy that had come to pervade European school curricula.
- 64 Trans. by Scott, op. cit., 39.
- 65 Paul F. Grendler, *The Universities of the Italian Renaissance* (Baltimore and London, 2002), 305–306.
- 66 Cf. Barnes, 'The *Prisca Theologia* and Lutheran Confessional Identity,' 46–47.
- 67 Jessenius, *Zoroaster*, sigs. A3r–A4r.
- 68 For Bureus's depictions of the garden complex, see LSB MS N 24, fols. 131r–v, 190r; KB MS Fa. 9, unpag. [27–28]. For Bureus's notes on the three-tiered system of education, see for example LSB MS N 24, fols. 174v, 179r.
- 69 Sten Lindroth, *Svensk lärdomshistoria*, vol. 2, 129–130.
- 70 Robert S. Westman, 'The Melanchthon Circle, Rheticus, and the Wittenberg Interpretation of the Copernican Theory,' *Isis* 66, no. 2 (1975), 170.
- 71 Adam Mosley, 'The Reformation of Astronomy', in Bridget Heal and Ole Peter Grell (eds.), *The Impact of the European Reformation: Princes, Clergy, and People* (Aldershot, 2008), 236–237.
- 72 Lindroth, *Paracelsismen i Sverige*, 131 n. 1.
- 73 Cardano qtd. and trans. by Ian Maclean, 'The Interpretation of Natural Signs: Cardano's *De subtilitate* versus Scaliger's *Exercitationes*', in Brian Vickers (ed.), *Occult and Scientific Mentalities in the Renaissance* (Cambridge, 1986), 244. Bureus was an avid reader of Cardano, particularly on the topic of astrology. See for example KB MS Fa. 2, fol. 70v.
- 74 For Baronio, see for example KB MS Fa. 12, fol. 167r. For Steuco, see for example LSB MS N 26, 18, 28.
- 75 *Hebraeorum philosophia antiquissima* (Uppsala, 1641). On Scheiner's theory of a rotating sun, see Peter Dear, *Discipline and Experience: The Mathematical Way in the Scientific Revolution* (Chicago, 1995), 167.
- 76 KB MS Fa. 12, fols. 308v–309r.

- 77 Clavius, *In sphaeram Ioannis de Sacro Bosco commentarius* (Lyon, 1602), 7–8. Cf. Volker R. Remmert, “‘Our Mathematicians Have Learned and Verified This’: Jesuits, Biblical Exegesis, and the Mathematical Sciences in the Late Sixteenth and Early Seventeenth Centuries’, in Jitse M. van der Meer and Scott Mandelbrote (eds.), *Nature and Scripture in the Abrahamic Religions: Up to 1700*, vol. 1 (Leiden, 2008), 667.
- 78 Clavius, *In sphaeram Ioannis de Sacro Bosco commentarius*, 3–4: ‘Constat igitur, Astronomiam scientiam esse antiquissimam, cum ante diluvium, immo sub initium mundi extiterit, ut iure optimo cum omnibus aliis artibus, ac disciplinis de antiquitate possit decertare, quandoquidem nullam legimus fuisse antiquorem. Hinc sit, ut ii auctores qui in historiis leguntur fuisse primi Astronomiae inventores, ipsam potius iam diu inventam, immo a primordiis mundi exortam illustrasse, novisque additionibus adauxisse censendi sint, quam adinvenisse, et ob is primos eos huius disciplinae auctores appellatos esse.’
- 79 Clavius, *In sphaeram Ioannis de Sacro Bosco commentarius*, 3. Clavius’s account is largely a quotation of Josephus, *Jewish Antiquities* 1.70–71, with the exception that Clavius presents the story in such a way that the sons of Adam are accredited with inscribing their father’s astronomical knowledge on the columns. Josephus, in contrast, ascribed both the invention and the inscription to the sons of Seth.
- 80 KB MS Fa. 14, 7.
- 81 Gerhard Dorn, *Congeries Paracelsicae chemiae de transmutationibus metallorum* (Frankfurt, 1581), 154–155: ‘Primus professor ac inventor artium Adam et huius, per lumen a Deo sibi concessum, a quo rerum omnium cognitionem habuit ante et post lapsum, praesagivit mundum per aquam esse renovandum vel potius castigandum, pauloque minus quam delendum. Hoc ipso factum est, ut eius successores duas lapideas tabulas erigerent, quibus omnes artes naturales a principiis suis insculperunt, idque hieroglyphicis characteribus, ut praesagium hoc posteris etiam innotesceret, ac observaretur periculorum tempore futurorum matura provisio. Noach postmodum in Armenia tabularum unam invenit sub monte Araroth transacto diluvio, qua quidem superioris firmamenti, et inferioris globi rationes et planetarum cursus designabantur. Tandem universales eiusmodi notiones particulatim in diversa distractae, viribus imminutae sunt, ut haec separatio hunc astronomum, illud vero magum, alium cabalistam, et quartum alchimistam effecerit’. Bureus transcribed Dorn’s account in KB MS Fa. 12, fol. 310r–v; and again (in what I take to be a later transcription) in LSB MS N 24, fol. 79r.
- 82 Håkan Håkansson, ‘Alchemy of the Ancient Goths,’ *Early Science and Medicine* 17 (2012), 508–509.
- 83 KB MS Fa. 21, 5. Cf. LSB MS N 24, fol. 79r, where above his transcription of Dorn’s account of the columns he noted, ‘Så är runorne och universales/ Så att alla artes är där inne’.
- 84 Cf. Hans Baron, ‘The *Querelle* of the Ancients and the Moderns as a Problem for Renaissance Scholarship’, *Journal of the History of Ideas* 20 (1959), 3–22. P. O. Kristeller, ‘Philosophy and Humanism in Renaissance Perspective’, in Bernard O’ Kelly (ed.), *The Renaissance Image of Man in the World* (Ohio, 1966), 39–41. See also Paula Findlen, *Possessing Nature*, passim. Anthony Grafton has discussed the problem in a number of essays and articles; see for example the collections *Defenders of the Text: The Traditions of Scholarship in an Age of Science, 1450–1800* (Cambridge, 1991); and *New Worlds, Ancient Texts: The Power of Tradition and the Shock of Discovery* (Cambridge, MA: Harvard University Press, 1992), with April Shelford and Nancy Siraisi.
- 85 Kepler, *Apologia pro Tychone contra Ursum*, trans. by Nicholas Jardine, *The Birth of History and Philosophy of Science*, 155.
- 86 Kepler qtd. and trans. in Anthony Grafton, ‘Johannes Kepler: The New Astronomer Reads Ancient Texts’, in Anthony Grafton et al. (eds.), *Commerce with the Classics: Ancient Books and Renaissance Readers* (Ann Arbor, 1997), 191.
- 87 Luke 15:9.
- 88 Johannes Magnus, *Historia de omnibus Gothorum Sueonumque regibus* (Rome, 1554), 123–124. Cf. Jordanes, *De origine actibusque Gothorum* 11.

- 89 KB MS Fa. 21, 5.
- 90 For Bureus, Gothia, the original homeland of the ancient Goths, was located in the southern section of the Swedish peninsula.
- 91 KB MS Fa. 21, 5.
- 92 Bureus's extensive notes on Zoroaster, which include his attempts to establish that the sage had originally come from Bactria rather than Chaldea, are found in LSB MS N 26 and KB MS Fa. 12. The theory that Zoroaster led the first group of settlers to Sweden is presented in KB MS Rål. 9, 16–18, 86. Compare the corresponding passages in KB MS Fa. 21, 11, [68].
- 93 Ficino, *Theologia Platonica* 4.2.1, translated by Michael J. B. Allen, *Platonic Theology*, vol. 1 (Cambridge, 2001), 297. Bureus was well acquainted with Ficino's genealogy of ancient theologians. See for example Ficino's Proemium to his Plotinus commentary in *Opera* (Basel, 1576), 1537, transcribed by Bureus in LSB MS N 26, 13. The passage in question is a nearly verbatim transcription of a passage in a letter from Ficino to Janus Pannonius (*Opera*, 871–872), translated by Michael J. B. Allen in *Synoptic Art: Marsilio Ficino on the History of Platonic Interpretation* (Florence, 1998), 14: 'Thus it happened that a pious philosophy was born in those days among the Persians under Zoroaster and among the Egyptians under Mercurius, and that each was in accord with the other. This pious philosophy was then nurtured among the Thracians under Orpheus and Aglaophemus. It reached its early manhood among the Greeks and Italians under Pythagoras. At length it came to maturity in Athens under the divine Plato.' The classic study of the ancient wisdom tradition in English remains D. P. Walker's *The Ancient Theology: Studies in Christian Platonism from the Fifteenth to the Eighteenth Century* (London, 1972). Wouter Hanegraaf has added a number of important clarifications in *Esotericism in the Academy: Rejected Knowledge in Western Culture* (Cambridge, 2012), Chapter 1. Ficino's position has been discussed recently by Hanegraaf (idem, 41–53) and Moshe Idel, 'Prisca Theologia in Marsilio Ficino and in Some Jewish Treatments', in Michael J. B. Allen and Vaery Rees (eds.), *Marsilio Ficino: His Theology, His Philosophy, His Legacy* (Leiden, 2002), 137–158. For a discussion of Bureus's view of the ancient theology, see Håkan Håkansson, *Vid tidens ände: Om stormaktstidens vidunderliga drömvärld och en profet vid dess yttersta rand* (Gothenburg and Stockholm, 2014), Chapter 5.
- 94 See Bureus's notes from the final section of the *Heptaplus* ("Exposition of the First Phrase: 'In the Beginning'") under the heading 'Triplex Mundus', in LSB MS N 24, fol. 51v. The passage reads in Douglas Carmichael translation (*On the Dignity of Man* (Indianapolis and Cambridge, 1998), 173): 'In the first place, therefore, it should be noticed that the world is what Moses calls "the great man." For if man is a little world, then certainly the world is a great man. Taking opportunity from this, he appropriately represents the three worlds, the intellectual, the heavenly, and the corruptible, by the three parts of man, by this metaphor not only indicating that all the worlds are contained in man, but also stating briefly which part of man corresponds to which world.' For Reuchlin, see LSB MS N 24 fol. 45v for his gloss of the discussion of the microcosmos in *De arte cabalistica* (Haguenau, 1517), fol. 20r.
- 95 Bureus's notes from his readings of these authors are strewn throughout LSB MS N 24. Cf. Lindroth, *Paracelsismen*, 117–128; Håkan Håkansson, 'Alchemy of the Ancient Goths', 517–522. For a discussion of Khunrath's idea of the interconnectedness of the microcosm and macrocosm, see Peter Forshaw, *Ora et Labora: Alchemy, Magic, and Cabala in Heinrich Khunrath's Amphitheatrum sapientiae aeternae (1609)*, vol. 1 (Dissertation, Birkbeck, University of London, 2003), passim, e.g. 80.
- 96 LSB MS N 24, fol. 68r, where he drew a diagram based on Thesis XCI in the *De opere Dei creationis* (Frankfurt, 1597), 33. Cf. Lindroth, *Paracelsismen*, 127.
- 97 The main difference between the world systems proposed by Roeslin and Tycho was that the former retained the notion that the cosmos was composed of solid and impenetrable spheres, while the latter replaced the spheres with a fluid cosmos. On Roeslin's claim of originality, see Jardine, *The Birth of History and Philosophy of Science*, 48.

- 98 Ursus, *Tractatus*, trans. by Nicholas Jardine, *The Birth of History and Philosophy of Science*, 48.
- 99 On Roeslin's arguments in a later exchange with Kepler, see Miguel A. Granada, 'After the Nova of 1604: Roeslin and Kepler's Discussion on the Significance of the Celestial Novelties (1607–1613)', *Journal for the History of Astronomy* 42, no. 3 (2011), 356–357.
- 100 LSB MS N 24, fol. 67v, which Bureus filled with notes and diagrams based on Theses X–XIII in the *De opere Dei creationis*, 11–12. The reference to Hermes is in Thesis XIII. On the three principles of Paracelsus, see Walter Pagel, *Paracelsus: An Introduction to Philosophical Medicine in the Era of the Renaissance*, 2nd ed. (Basel and New York, 1982), 100–104. The reference to Hermes as an expounder of the symmetry of these triads was likely a reference to a passage in the Pseudo-Paracelsian *De natura rerum* (first pub. 1572) that Bureus would eventually become acquainted with. See Lindroth, *Paracelsismen*, 195.
- 101 LSB MS N 24, fol. 67v: 'Trinitas in natura ex Rösolino som corrigerar Tychonis hypotheses.' On Roeslin's concept of a finite universe, see Thesis XXIX.
- 102 On Tycho's conception of the ether, see for example Victor E. Thoren, *The Lord of Uraniborg: A Biography of Tycho Brahe* (Cambridge, 1990), 301–302. For Roeslin's contrasting view, see Granada, *After the Nova of 1604*, 355–356. Bureus noted that Roeslin had claimed that the element of fire functioned as ether, thereby proposing a division between the 'material' elements of air, water, and earth, and the 'formal' element of fire. Yet Bureus perceived an intrinsic connection in this hierarchy that was not present in Tycho's elemental theory, as is evident from his depiction of Röslin's elemental theory as a three-sided pyramid with fire placed at the upper point and air, water, and earth at the three corners of the base. Bureus viewed fire as a unifying force in relation to the other elements, whereas as the Aristotelian (and Tyconic) notion of quintessential ether was entirely removed from the natural order. Cf. Lindroth, *Paracelsismen*, 127–128.
- 103 Adam Mosley, *Bearing the Heavens*, 97.
- 104 LSB MS, Spr. 1, fols. 1r – 28r. For a discussion, see Lindroth, *Paracelsismen*, 190–216.
- 105 The full title reads, *Hebraeorum philosophia antiquissima, divinae potentiae, sapientiae et bonitatis revelatrix, a Mose primo quasi promo vulgata historice, a caeteris sanctis celebrata symmetrice, novis artificum observationibus illustrata, hic pro captu disposita synoptice; veri inquisitoribus destinata unice, ab antiquitatis studioso Johanne T. A. Bureo Sveone, die aetatis suae 26944* (Uppsala, 1641).
- 106 *Hebraeorum philosophia antiquissima*, top right. For a recent discussion of the genre of Mosaic physics, see Ann Blair,
- 107 'Iudeus, Turca, Paganus, si typice agnoverint, Christianos fore quis dubitabit?'
- 108 Bureus's understanding of natural phenomena as 'hieroglyphic' signs was informed to a great extent through his reading of Khunrath's *Amphitheatrum*. See for example *Amphitheatrum* II, 141–142: 'Concurrit enim totius Naturae signatura in Micro-Cosmo. Hi characteres Naturae, et notae hieroglyphicae, certum efficiunt sensum et sententiam, quae a Sapientibus et huius scripturae ac literaturae naturalis gnaris probe intelliguntur.' Cf. Forshaw, *Ora et Labora*, vol. 1, 59–60.
- 109 *Hebraeorum philosophia antiquissima*, middle of the page. See also KB MS Fa. 3, 46; KB MS Fa. 14, 131. Ficino, *Liber de Sole*, Chapter 11, G. Cornelius et al. (tr.), in Angela Voss ed., *Marsilio Ficino* (Berkeley, 2006), 207–208: 'According to the Platonists there are three principles: the good itself, the divine intellect and the world soul. Only light clearly contains all of them in itself. It reveals the good itself, since while it surpasses wonderfully all things, it also spreads itself through all things, and recalls them to sublime planes at the same time with its miraculously preserved excellence and purity. It reveals the divine intellect because it declares, distinguishes and adorns everything, and the world soul, because it generates, warms and moves everything with a vital heat'. Cardano, *De subtilitate* (Nuremberg, 1550), 325–326. See Hiro Hirai, *Medical Humanism and Natural Philosophy: Renaissance Debates on Matter, Life and the Soul* (Leiden, 2011), 110–113. Bureus's reflections on the correspondence between the 'ancient' Swedish words for sun (*sun*), son (*sun*), and health (*sundhet*; compare *sund*, 'healthy') were inspired in part by similar etymological speculations proposed by Goropius Becanus in

the *Hieroglyphica*, published in *Opera [. . .] Hactenus in lucem non edita* (Antwerp, 1580), 234 (separate pagination).

110 *Hebraeorum antiquissima philosophia*, bottom left: ‘Si Ethnicis, Jovis omnia Plena: quanto magis nobis, omnia Plena Jehovahae. Vacua Vivaria, Domini Penuria. / Ita Copernicei Circuli, Scheineri et Galilei Maculae, factae sunt ITA Burei Faculae’.

111 See for example KB MS R.1. 9, 46; KB MS F.a. 21, [28–29].

12 By natural means

Magic and medicine in Ericus Johannis Prytz's *Magia incantatrix* (1632)

Martin Kjellgren

‘Is it sorcery, not to bandage the wound, but the iron wherewith the injury is done?’¹

With this question, the Swedish priest Ericus Johannis Prytz began a new chapter in his *Magia incantatrix* – a handwritten treatise on the ‘foul and hideous sin of sorcery’, completed in 1632 according to its title page.² As a scholar and a clergyman, a sworn enemy of witches and warlocks, and recognised for having a ‘guarding eye in his office against false teachings’,³ Prytz had in previous chapters revealed the demonic roots and devilish nature of all kinds of witchcraft. Now he turned his attention to the issue of the *Waffensalbe* or weapon salve – a ‘marvellous’ therapy for wound healing, generally attributed to the Swiss physician, alchemist and mystic Philippus Aureolus Theophrastus Bombastus von Hohenheim, better known as Paracelsus.⁴

Descriptions of the weapon salve first appeared in magical and medical handbooks in the late sixteenth century. While consisting of ingredients such as moss grown upon a human skull, mummy powder, human fat, rose oil, and honey, this ointment was supposed to harness the sympathies between a wounded body and remnants of blood upon the afflicting weapon. In other words, by anointing and bandaging the weapon, the diligent physician would be able to heal a wound at a distance, without even touching the patient.⁵

At first the weapon salve rendered only occasional comments and reactions in medical literature. But when Rudolph Goclenius, physician and professor of medicine at Marburg presented his own version of the recipe and advocated the use of this ‘magnetic treatment of wounds’ in a 1608 treatise, he provoked an agitated debate, engaging some of the most renowned intellectuals and natural philosophers of the time. While vindicated by Goclenius, by Johannes Baptista van Helmont, Oswald Croll, and Daniel Sennert, the weapon salve was attacked by among others the physician and alchemist Andreas Libavius and the Jesuit theologian Jean Roberti – and the debate would continue for several decades.⁶ The year before Prytz wrote his treatise, the weapon salve had become the issue of a venomous controversy between William Foster – the parson of Hedgely in Buckinghamshire – and the famous physician, astrologer and mystic Robert Fludd.⁷

The arguments in the debate differed. Some scholars questioned the various theories of how the effect of the weapon salve was achieved; others

expressed their scepticism towards the efficacy of the therapy as such. Reasoning based on natural philosophy were met with theological arguments and objections and vice versa.⁸ In some cases the controversy also mirrored open confessional divergence, as when the Jesuit Roberti stated that only a hardened Calvinist like Goclenius could propagate the blasphemous belief in the weapon salve.⁹

Yet in the end, the arguments converged in the same crucial question raised by Prytz. The effect achieved by the weapon salve was in one sense preternatural – it worked through hidden or occult causes that could not be satisfactory determined as either natural or unnatural or even outright diabolical. This meant that suspicions of witchcraft could surface at any moment, despite profound theories of occult qualities or claims that sympathetic medicine worked ‘naturally, and without any magick’.¹⁰

In other words, the issue whether the weapon salve should be regarded as a natural remedy or as a devilish device was not to be taken lightly. Prytz’s question was not just rhetorical, and his concern was genuine; the danger of sorcery was real, and the issue of discerning allowable practices and arts from sorcery and superstition – and thus God’s works from Satan’s – was literally vital and deadly serious.

In the following, I will analyse Prytz’s treatise and his argument concerning this literally burning issue. I will examine how he defined sorcery, and how he discerned ‘natural arts’ and ordinary medical practice from witchcraft in cases where the boundaries were vague and disputed. Set in context of the Swedish Reformation, seen both as a cultural and a social process, I will also analyse the text of *Magia incantatrix* in order to problematize an over-simplified view on the clerical discourse on witchcraft as an uncomplicated, biblicistic act of categorization, where virtually all preternatural phenomena were routinely condemned as suspicious and as potential instances of sorcery.

Sorcery, magic and the Reformation

Until fairly recently, it was an established fact that the Reformation, as a logical consequence of the Renaissance, played an essential part in what was conceived as stages in a successive process of rationalisation, secularisation and – as phrased by Max Weber – of disenchantment of the Western world. As they challenged clerical authority, rejected central aspects of Roman Catholic sacramentalism and persecuted magical practices among the plebs, Lutheran and Calvinist reformers were regarded as precursors of a new, secularised and disenchanted worldview where religion eventually became a private issue, God was no longer the answer to the questions of the scientists, and magic had been rejected as superstitious poppycock.¹¹

Yet even a superficial view of *Magia incantatrix* with its religious language and argumentation strewn with biblical quotes reveals that Prytz can hardly be regarded as a proto-Enlightenment thinker. His belief in magic reality is firm and inseparable from his worldview as a whole – and as demonstrated by

the weapon-salve controversy, the same may be said of his scholarly peers in the contemporary intellectual debate in Europe. When Johannes Baptista van Helmont refined the formula of the weapon salve, and in contrast to Goclenius emphasised the presence of blood upon the weapon as essential to make the cure efficient, his aim was not just to adjust the preparation of the salve to fit its theoretical basis of sympathetic magic. As he also ridiculed Goclenius' notion that the moss used in the salve must come from the skull of a hanged thief, when any skull or bone left in the open air would do the trick, this appears as an attempt to lessen the nimbus of illicit magic and dark arts surrounding the method as a whole. But van Helmont also refuted the tendency of Roberti to use theological arguments in general, and references to the will and actions of the devil in particular, in order to solve an issue rightly belonging to the field of natural philosophy.¹²

Thus the controversy of the weapon salve seems to turn ingrained ideas of disenchantment on their heads. The Calvinist Goclenius defended the method and enhanced the magic elements involved; the Jesuit Roberti recognised the belief in the method as typically Calvinist, whereas the Catholic scholar van Helmont defended a magical practice with arguments that could – with a slight anachronism – be described as based on scientific theory and method.

Now the obvious reason for the discrepancy between historical evidence and the narrative of disenchantment, is that the whole conception of the Protestant roots of Western science and rationality is a myth. As has been shown by scholars as Hildred Geertz, Stanley Tambiah and Richard Kieckhefer, notions of 'magic', 'religion', 'science' and 'rationality' can no longer be conceived as transhistorical and static. Robert Scribner has in an influential article discussed the whole conception of disenchantment, and of the alleged, semi-modern rationality of the Protestant reformers, as part of a Post-Enlightenment paradigm, while historians of science like Charles Webster, Andrew Cunningham, Perry Williams, Simon Schaffer and Steven Shapin have revealed and analysed the metaphysical, religious and even outright apocalyptic foundations of the 'new science' of the seventeenth and eighteenth centuries.¹³ All in all, this suggests that the narrative of the disenchantment of the Western world, as it is based on anachronistic uses of concepts as 'rationality' and 'superstition', reveals sentiments and views of the nineteenth and twentieth centuries, rather than of the age of the Reformation.

However, this does not mean that conceptions of magic and sorcery did not change over time, or that the Reformation had nothing to do with this change. Throughout the era, reformers of all denominations – Lutherans, Calvinists and Catholics – did their best to root out heresy and sin among the subjects, and in this ambition they also turned their attention to various kinds of magic. Practices that had previously been tolerated as superstitious but innocuous were successively regarded as potential cases of idolatry, performed through pacts with demons. In the apocalyptic atmosphere that characterised the whole era, visions of heretics, devil worshippers, and witches, conspiring the downfall of Christianity intertwined with widespread fears of *malefici* – sorcerers that with

demonic assistance could harm and even kill their enemies by magical means or sheer malignity. Without reducing the complex issue of early modern witch trials to these factors, it remains clear that such fears, widely shared by clergy and laymen, interacted in an inflammable brew, with persecution and death sentences in worldly and clerical courts, as well as with occasional outbursts of witchcraze as its logical consequence.¹⁴

In other words it may be argued that hardening attitudes towards various magical practices – and thus more categorical distinctions drawn between the acceptable and the illicit – appeared as the result of a continuous process of confessionalisation, and of ambitions to reform and to socially and morally discipline the subjects.¹⁵ Obviously these ambitions involved elements of power politics and claims of clerical authority, but they must also be understood as part of what was conceived as an apocalyptic reality by the reformers, where sorcerers and witches fulfilled the work of Antichrist, and when Satan's wrath ravaged the world in its final age, 'because he knoweth that he hath but a short time'.¹⁶

A nation of faith

Thus *Magia incantatrix* may appear as an example of a common ambition among European clergymen and reformers of the early seventeenth century. But it was also written in a Swedish context – a context that in Swedish historiography has been described more or less as an intellectual and cultural wasteland, where conformism and 'the principle of religious intolerance' seemed to smother all kinds of scholarly ambition and debate.¹⁷ This image of seventeenth-century Sweden as a nation culturally subjected to a cadre of black-robed 'orthodox' clergymen is still vivid. 'In the era of the religious wars', as stated in a recent survey, 'true faith was emphasized all over Europe, but more so in Sweden than anywhere else'.¹⁸

There are arguments for such a view. Obviously the conditions for a free scholarly debate were not ideal; in the wake of the Reformation, the religious orders had been dissolved, convent schools were closed and libraries were plundered and shattered. Uppsala University closed in the 1520s, and all efforts to reinstate higher education in the realm proved abortive for seventy years – partly due to clerical resistance against the ecclesiastical ambitions of the kings of the Vasa dynasty. After the deposition of the Catholic King Sigismund and the violent dissolution of the personal union with Poland in 1599, the gravest conflicts slowly seemed to settle. Yet instead, as a consequence of this revolution, the confessional issues became the main basis for the legitimacy of the new regime. When Uppsala University was reopened in 1595, it primarily functioned as a bulwark for the true Evangelical confession as defined in the Synod of Uppsala in 1593. Although chairs in medicine, law, and politics were appointed in the 1610s, theology remained the main subject in the curriculum. This was still the case when the university was eventually provided with adequate economical resources by a donation of King Gustavus Adolphus in

the 1620s. From the clerical point of view, the university's other main function – to educate worldly clerks to serve in the bureaucracy of the expanding state – appeared as secondary at best.¹⁹

Throughout the Reformation era we may also see how the Swedish clergy fostered an ambition to reform the faith and morals of the subjects, and to purge society from remaining Catholic practices, heresy and other abominations. As the worldly authorities successively took over the responsibility of prosecuting magical crimes, voices were raised by the clergy, asking for adjustments of the legislation in order to meet what was conceived as the acute threat of warlocks and witches. After the turn of the seventeenth century, death penalties became more frequent in juridical practice, even for magical crimes that had previously been rectified with church discipline and fines – or, as during the infamous visitation of Archbishop Abraham Angermannus in 1596, with the lash and with cold water over the delinquent's back.²⁰ Capital punishment for sorcery was eventually codified in an appendix to the Code of Laws in 1608. With the ambition to impose the Law of God in accordance with the Pentateuch upon the Swedish people, the statement of Exodus was normative: 'Thou shalt not suffer a witch to live'.²¹

A warrior of God

It was in this context of conforming tendencies and prosecution of magical practices, fuelled by agitated apocalyptic expectations that Prytz wrote his treatise. The visions of satanic machinations within the very body of Christ had not ceased after the turn of the seventeenth century. Instead, they reached a climax with the Swedish intervention in the wars in Germany in the beginning of the 1630s, as King Gustavus Adolphus – identified with the prophesied Lion of the North in pamphlets and leaflets – appeared as a champion of true faith in a conflict that had literally swollen to apocalyptic proportions.²² Thus the wars in Germany loomed as a manifestation of the deadly threat that still hung over the congregation of God – a threat that also appeared in the local society, disguised as plain sin, superstition, heresy, apostasy and witchcraft.

That Prytz was not alone in his concerns becomes clear in the sermon, held at his funeral in September 1637. Here his colleague Laurentius Laurinus claimed that Prytz, throughout his life had walked 'in a true faith', preached the 'pure and unadulterated' Word of God and rightly administered the sacrament. Moreover, he had 'distinguishably practiced' all his intellectual ability to avert false teachings – primarily in orations held at synodal meetings and in 'his *privatae disputationes* in the schools Norrköping and Söderköping', where he had been teaching.²³

But Laurinus also emphasised that Prytz with 'reproving and exhortation' from the pulpit had 'contended and through Church discipline subdued' sin and aberration among his parishioners. For this he had incurred the hatred of warlocks and witches, and as a consequence he was exposed to their spells and incantations, 'just as a Warrior must face the enemy, when standing on the

battlefield'. This was not just a metaphor: according to Laurinus, Prytz was well aware 'that such people had destroyed his predecessor, Reverend and well learned Master Anders, Dean and Vicar here, and several of the pastors in this very deanery through sorcery'. Yet he did not fear, 'as he fulfilled his duty while commending the issue to God'.²⁴

The rhetoric of the sermon reveals some notable sentiments among the clergy. Laurinus obviously placed his dead colleague within a collective of literally orthodox clergymen, fighting the abundant heresies and devilish superstitions that threatened the Christian congregation as the apocalypse approached – just as the Swedish army fought the war against the joint forces of the Roman emperor and the papal Antichrist across the Baltic Sea. But through the formulations we may also perceive the physical fears of hidden, devilish powers, channelled through the incantations of the *malefici*.

That the atmosphere among the clergy in the deanery was nervous is quite obvious. Two decades previously the province of Östergötland had witnessed one of the first large-scale witch hunts within the Swedish realm. In 1614, Duke Johan – autonomous ruler of the province – had issued a decree with harsh and arbitrary penalties stipulated for sorcery, explicitly in order to correct what, despite legislative revisions, could not be thoroughly dealt with according to the letter of the law.²⁵

According to one relation, it was Ericus Prytz's older brother, Claudius, who instigated the witch trials; shortly after his appointment as chaplain at the ducal court in 1611, he is said to have uncovered a witch who had threatened to destroy the duke through *maleficium*.²⁶ In *Magia incantatrix* two other witches are mentioned, who were burned in 1617 after having 'destroyed their Highnesses Duke Johan and his beloved consort, Lady Maria Elizabeth, now both with God in honourable remembrance'.²⁷

These two reports are late and rather uncertain, but they do indicate that the personal fears of Duke Johan at some level interacted with the ambition of the clergy to root out what appeared as virtual plague of sorcerers scourging the Christian congregation. Preserved protocols also confirm that at least seven women were tried and executed for witchcraft between 1616 and 1620, and that water ordeals as well as torture were regularly used in these processes.²⁸

Apart from his brother's alleged role, there are no indications that Ericus Prytz was personally involved in any of these witch trials. In 1615, he had travelled to Greifswald to study, and in the following year, he continued his peregrination to Wittenberg. On his return to the Fatherland as a master of arts in 1618, some of the panic seems to have settled. When Prytz wrote his treatise in 1632, the fires of the witch trials had faded – for the time being. Yet as demonstrated by the rhetoric of Laurinus' sermon, the anxiety of the clergy had not ceased, and the determination to fight the good fight against sorcerers and witches to the end of time had not slackened. As stated by Prytz on the title page of *Magia incantatrix* through a quote from the Prophet Micah: 'I will, says the Lord, root out the sorcerers nigh you so that no soothsayers will remain'.²⁹

On the origins of sorcery

Given this context, what could be expected from the handwritten pages in Prytz's treatise is clear categorizations and distinctions made to separate allowable arts and practices from illicit sorcery and witchcraft. Moreover, we could expect relentless denunciations of sorcery of all kinds – not only of malevolent and harmful practices, but also of practices that appeared innocuous or even useful to the ignorant, like medical treatments and acts of divination performed by the local cunning folk.

Magia incantatrix was not written for academic purposes, and the text is probably not one of Prytz's 'private dissertations' mentioned in the funeral sermon. The language is vernacular Swedish, and as it was intended as a 'small instruction' on witchcraft it rather appears as an educational handbook for Prytz and his colleagues in their preaching and in their fulfilling of other pastoral duties. The text is disposed in a catechetical manner with questions and answers, followed by expositions supported by biblical quotes and other references. Each question addresses an issue of some importance in Prytz's explicit mission to instruct and warn his readers and listeners against the abomination of sorcery 'which has been practiced much among the pagans of yore' but now had spread and was widely used 'among many of the Christians'.³⁰

When defining sorcery, Prytz could certify that it was a 'devilish work' wherewith Satan either 'through his warlocks, sorcerers and witches, blind the eyes of people', or 'after God's allowance', through devilish phantasms and lies 'mislead people into delusion, hideously abusing the elements, God's creations'. In the end, the purpose of all sorcery was to lure people into apostasy 'to God's disgrace, and to Man the utter perdition and to the greatest peril of the soul'.³¹

However, even though Prytz could easily identify the devil as the utmost cause and instigator of sorcery among men, the craft had its worldly inventors as well. With reference to 'Many of the historical writers, as Pliny, Orosius, Trogus, and others', Prytz named Zoroaster as the one 'who first has invented this foul act of sorcery'. While referring to the statement from Pliny's *Naturalis historia* that Zoroaster, 'contrary to the births of all others in the world' had laughed at the day he was born, Prytz could maintain that his birth was 'a sign and a presage of the evil work, sorcery, which he would invent'. For, as stated in the apocryphal Book of Wisdom, 'my first voice, as all others', was cries'.³² Thus Prytz refers to pagan classics like Pliny in his argument, as well as to Christian authors as Paulus Orosius; yet with the quote from the Apocrypha, he makes sure that the relation of Pliny is given its proper interpretation in accordance to the Scriptures.

Through Pliny, the notion of Zoroaster as the inventor of 'the futility of the [Persian] Magi' had become commonplace in the classical scholarly tradition.³³ Yet in Prytz's discussion this notion, mainly adapted to enhance the otherness of magical practices, was also related to biblical history, as Zoroaster, 'king of the Bactrians', according to some authors, 'should have been either Ham or one of his sons'.³⁴

The identification of the inventor of sorcery with Ham – the son of Noah who according to Genesis ‘saw the nakedness of his father’ and whose offspring therefore was cursed – occurs in several Christian sources of late antiquity and of the middle ages.³⁵ In the sixteenth and seventeenth centuries, it was a well-known part of the historiography of witchcraft and magic. Laurentius Paulinus Gothus – bishop of Strängnäs and an older contemporary of Prytz – had made a similar statement in a chapter on ‘*Magia illicita*, or ordinary superstition’ in the first volume of his *Ethica christiana* from 1617. Here Paulinus maintained that sorcery, through Zoroaster, ‘has its origin among the Persians, who were descendants of the cursed Ham’.³⁶ In context of their respective argument against sorcery, the point made by both Prytz and Paulinus therefore becomes quite clear: illicit magic was first exercised, not just by strangers and foreigners in general, but by an outcast people, expelled from the People of God from the earliest of times.

By natural means

Yet despite the devilish origin of sorcery and the nefarious character of those who acquired and exploited the arcane secrets of the dark arts, Prytz’s was fully aware that his judgement was not shared by everybody. Many people, ‘in particular those who practice sorcery’ and therefore are ‘captured by the snare of the devil after his will’, may think that their craft is ‘a natural work and a liberal art, since they have been instructed by others and often use natural means thereto’.³⁷ However, this futile defence of witchcraft was nothing but a ‘devil’s act and deceit’. According to Prytz, ‘no one can learn sorcery, without first making compact with the devil, and the means he then use to practice sorcery may very well be natural, but they are not used after natural manners’. Thus ‘there is no power to conjure’ in the natural things; such powers may only be provided ‘through the operations of the devil’.³⁸

To emphasise his point, Prytz also poured his scorn on contemporary magical practices: ‘For what power could there be in a yarn, when they untie a knot thereupon to make storm and tempest? Or what power can there be in a straw to shoot with, to kill a man or any other Creature?’³⁹

Prytz’s remark did not indicate that such practices were harmless. On the contrary; as suggested in both *Magia incantatrix* and in Laurinus’ funeral sermon, Prytz did not doubt that *malefici* had powers to inflict harm or even kill their enemies. The mentioned trick to sell ‘wind knots’ to seafarers had been described by Olaus Magnus in his *Historia de gentibus septentrionalibus* from 1555; there it was condemned, as it like all ‘magic knowledge’ was ‘based on fraudulent principles’ and exploited the insecurity of seafaring people. But Magnus also recognised the powers of the mages to ‘contend the elements’, and he noticed that those would meet with misfortune, who ‘with contempt denied that such power could be in the knots’.⁴⁰

Yet as indicated by Prytz, the natural means used by the sorcerers were not necessarily potent in themselves. Obviously there were herbs and minerals with

certain natural qualities that could be used for magical purposes, but it was the devil's manipulation of the elements that was the actual origin of the sorcerers' illusory power. According to Prytz, the use of natural means was delusive, as its only purpose was to make sorcery appear as an allowable, liberal art with methods, rules and traditions. An illusion of knowledge and authority was being created, wherewith the devil deceived his followers to serve him.

According to Prytz, there were several discernible varieties of sorcery. Primarily they emanated from divinatory practices that the pagans 'counted as their true worship', as for instance divination through the four elements – *pyromantia*, *aeromantia*, *hydromantia* and *geomantia* as defined by Marcus Terentius Varro – or *necromantia*, invoking the spirits of the dead, and *chiromantia*.⁴¹ Still the argument reveals that sorcery could not always be easily discerned from natural, liberal arts and practices. For even though ungodly people like Zoroaster had invented sorcery through the assistance of evil spirits 'as Lactantius and Eusebius allege',⁴² it remained clear that

... sorcery has first come into use under the appearance of being a prompt and convenient art of medicine, *item* a great proficiency in mathematical, and particularly in astrological issues, in order to observe the planets of the heavens and calculate the nativities of men and thereof tell what will happen and come about; a craft that was in use among the Babylonians, and for which God reproached them ...⁴³

In this discussion, partly based on Polydore Vergil's *De rerum inventoribus*, Prytz thus emphasised the close resemblance between sorcery and natural arts, and he particularly pointed out medicine and astrology as perilous practices in the shady borderland between natural philosophy and witchcraft. A similar approach can be seen in Paulinus' *Ethica*, where Zoroaster was described as 'an excellent artist in the courses of the Heavens and other natural things'. But unlike the true natural philosopher, Zoroaster had not acquired his erudition through long studies, but 'through a secret Compact with the Devil', and moreover he had 'founded Schools, wherein he instructed many others about this devilish wiliness'.⁴⁴

That sorcery in some cases resembled medicine or astrology, or natural philosophy in general, did not suggest that such arts should be rejected *per se*. Obviously Prytz and Paulinus developed different approaches towards worldly learning in their discussions; especially Paulinus could in some contexts appear hostile towards Aristotle and the Neo-Scholastic tendencies in contemporary philosophy and physics.⁴⁵ For his part, Prytz had as a student in Uppsala defended a dissertation arguing against 'the uncertain and vain forecasts of the astrologers' – a subject that Paulinus also exposed at some length in the *Ethica* and other texts.⁴⁶ But neither Paulinus nor Prytz rejected worldly learning as such. On the contrary, they both shared the basic notion of medieval and early modern philosophy, namely that the creation reflected *Logos* – the divine wisdom and Word of God wherewith the world was created, redeemed and

sustained. The examination of nature could therefore be described as a kind of liturgy or worship, where the philosopher contemplated the ‘book of nature’, just as the theologian studied the Word in the Scriptures.⁴⁷ As long as the natural philosopher or the physician was a Christian of true faith, who performed his art with a humble and pious mind, there could – theoretically – be no objections to his achievements.

Sorcery and *magia naturalis*

Yet in their discussions, both Prytz and Paulinus seemed to preach vigilance to their readers. Any art or corpus of knowledge should be approached with caution; the devil often appeared disguised as an angel of light, and all Christians must be aware of the innate temptations of all intellectual endeavours. But if it appeared difficult to discern sorcery from medicine and natural arts in general, the problem would become even more intricate when the discussion involved preternatural phenomena that touched upon the arcane secrets of nature.⁴⁸

In the Christian context of the early Church, the very concept of *magia* had been associated with spiritual intelligences or *daemones*, generally identified with unclean spirits, fallen angels and ‘spiritual wickedness in high places’ to speak with the apostle.⁴⁹ Any art or practice, dealing with the preternatural, could therefore appear as suspicious. Or, as bitterly remarked by Thommaso Campanella, ‘the occult arts are constantly persecuted by the clergy’, since ‘the superstitious commoner’ tends to fear what he cannot understand and thus attributes what he sees to the works of demonic forces.⁵⁰

However, the concept of magic was complicated, and its significance and connotations would differ from time to time and from one author to another. When Paulinus defined the concept in the *Ethica*, he stated that *magia* was originally a Persian word, simply meaning wisdom or reason, and as such, it could refer to allowable knowledge, either in the H. Scriptures, or in Philosophical arts’.⁵¹ But he also made a laconic remark that the term was generally used to signify *magia illicita*, meaning forbidden prudence or just plain superstition, a category that Paulinus divided into the subcategories divination and sorcery.

In *Magia incantatrix*, the concept of magic was more thoroughly treated, as Prytz emphasised that the forces of nature ‘may appear in multifarious ways’. Strange things and wonders occurred in the world, and like Campanella, Prytz could see how he who did not understand the causes could easily believe natural phenomena to be the work of ‘sorcery and devilish art, which it is not, but the secret operation of nature, which only they who are the erudite and penetrating examiners of nature may understand’.⁵²

Thus you must distinguish between *Magiam naturalem* that is natural wisdom, and may be called a liberal art, and *Magiam incantatricem*, that is only the blindfold of sorcery and devilish superstition, which depends on no Art or natural effect, but only on the deceit and force of that spirit.⁵³

But even though it was of vital importance to separate sorcery from natural magic, the difference was not easy to tell. To unlearned and non-scholars, it was a distinction almost impossible to make, as they could hardly tell the difference between magic and medicine, between the bookish erudition of the natural philosopher and the dark knowledge of the sorcerer. Yet even the scholar could become puzzled. In a passage of *Magia incantatrix*, Prytz related the story from Genesis, when Jacob outwitted his uncle and father-in-law, Laban. The two men had made a deal that Jacob should 'separate all spotted and speckled sheep and all black sheep' from Laban's flock, 'and what would then become spotted and speckled, that should be Jacob's reward'.⁵⁴ Therefore Jacob took 'green aspen sticks, hazel and chestnut, and cut white stripes upon them', and as he then put the sticks in the watering troughs when the sheep was supposed to breed, all flocks 'conceived over the sticks, and gave birth to spotted, speckled and coloured'. To virtually everyone, Jacob's manipulation of the breeding flocks must have appeared as magical. But according to Prytz, 'this was no sorcery with the speckled sticks, but it had its natural causes'.⁵⁵

Formally, this remark was correct. The idea that sensory impressions and the imagination of the female part during sexual intercourse could make an imprint on the foetus was old and widespread. Embraced by such disparate scholars as Aristotle, Galen, Heliodorus of Emesa and the church father Jerome, the notion occurs in various sources – Greek and Latin, Jewish and Christian – from antiquity to modern times.⁵⁶ A physical explanation of the phenomenon, using the example of 'Iacob Patriarcha' had also been presented in a dissertation on 'Physio-Magical' theory, publicly defended at Uppsala University in 1610. Here the author (probably the praeses, Johannes Messenius) adopted a position in accordance with Aristotelian physics, as he explained that the imagination of any living creature could provoke physical change within the body and possibly in close adjacent bodies – or in a foetus. Normally the offspring of animals resembled their parents more than humans, whose imagination tended to be occupied by other things than just breeding during the sexual act. But when looking at the stripped sticks, and tasting the bitterness of the water caused by them, the imagination of the ewes was provoked, with speckled offspring as the natural result.⁵⁷

It is quite likely that Prytz had access to this dissertation when he wrote *Magia incantatrix*; he was studying in Uppsala when the disputation took place – at a time when 'the number of students' at the university 'was inconsiderable' – and there is also a preserved copy of the dissertation that has the signature of Prytz's father, Johannes Nicolai on the title page.⁵⁸ However, whether he got it from this dissertation or another source, there were obviously physical explanations to the phenomenon of which Prytz was fully aware, and which he could have used in order to support his argument. Yet despite the fact that Jacob's manipulations could very well be mistaken for sorcery in the eyes of the ignorant, no such explanation is exposed in the following – primarily since there was no need to discuss the issue further. Prytz wrote an educational text for

pastoral purposes, not an academic dissertation where he was supposed to dig deep into various arguments and explanations. Since sorcery and witchcraft was defined by the *pacta* between the practitioner and the devil, this was an option that could not be applied to the example. The idea that Jacob should use such practices to bend reality after his will was patently absurd, due to his authoritative status as a patriarch of God's chosen people.

Magic and sympathetic medicine

Prytz's example from Genesis demonstrates how the distinction between natural magic and sorcery was based on notions of religious, moral and intellectual authority. Before judging an act that took advantage of some preternatural phenomenon, you had to see for which purpose it was being performed, by whom, and whether the practitioner served God or the devil when doing it. In the case of Jacob, this was an easy task. It would not be so easy when the discussion moved from the biblical example to preternatural phenomena in a contemporary context – as for instance in Prytz's chapter on the weapon salve.

The weapon salve controversy involved several elements that contributed to the furore over the issue. Obviously the proliferation of the method may have enhanced the reactions: according to Kenelm Digby, who in the late 1650s propagated a similar 'powder of sympathy', the recipe had then become 'so divulged, that now there is scarce any Country-Barber but knows it'.⁵⁹ It has also been argued that the weapon salve 'temporarily seems to have become the major point of contention between the Galenists and the Paracelsians' – that is between the champions of traditional, old-school medicine and their challengers: medical reformers, iatrochemists and more or less self-acclaimed disciples of Paracelsus.⁶⁰ To some extent, the very name of the alleged inventor of the weapon salve became a tool in the debate, depending on whether Paracelsus was seen as a true authority in medicine, or as a magus. Thus William Foster could conclude that since Paracelsus undoubtedly was a conjuror and a witch, and since the weapon salve had occurred 'amongst his Diabolicall and Magicall conclusions, it cannot choose but be Witchcraft, and come from the grand master of Witches, the Divell'.⁶¹

However, one basic problem with the weapon salve in Prytz's discussion was the simple fact that it concerned medical treatments and the art of the physicians. As we have seen, Prytz had discussed medicine as a discipline that could easily mislead people and entice them to practice sorcery. Experience showed 'that sorcery has become successful among people through medicine', for there was no warlock or witch who did not use their craft 'to heal and cure, both man and beast'.⁶² But it was the abuse of the medical art that was condemned, not ordinary medical practice.

Obviously medicine was a discipline soaked in religious and ethical notions. Body and soul were inseparable in medical discourse, and both body and soul would become battlefields in the eschatological struggle between the forces

of good and evil. Martin Luther himself had emphasised the sacred role of the physician as 'God our Lord's mender of the corporeal, just as we theologians are of the spiritual'.⁶³ The physician thus mirrored the priest in his service to cure in more than one respect, as the causes of illness and afflictions were seen as a combination of natural worldly decay, of the workings of the devil, and of divine punishment of sins. 'He who sins before his creator, he must come into the hands of the physicians', as the court physician Wilhelm Lemnius quoted the apocryphal book of Sirach on the title page of a Swedish plague tract from 1572.⁶⁴ In 1588, the royal apothecary Simon Berchelt explained that penance and repentance were the foremost means to regain bodily health; the effect of medical treatments could be seen as means of divine grace only, provided from the natural pharmacy of 'the highest physician'. Yet it was still recommendable to seek help, comfort and advice among worldly physicians and apothecaries, who thus fulfilled a sacred duty.⁶⁵

Prytz expressed a similar verdict when he, also quoting the book of Sirach, emphasised that 'the Lord has created the physician, and healing comes of the most High'.⁶⁶ In practice, this meant that

. . . experienced physicians, along with wholesome cures, are sublime gifts of God, to the sick who are enduring pain and suffering, and need such things. Thus the sick may, if he has first turned to God in prayer, consult such physicians in his need and use their remedies, since God himself has provided wisdom to such physicians and virtue to the herbs, so that they may heal.⁶⁷

From a clerical point of view however, this position was not unproblematic. Medics could easily become trespassers on the field of the clergy, and when practiced by people who tangled with forbidden practices and demonic forces, Prytz argued that medical treatments, being they ever so effective, would only lead to perdition, since 'sorcerers are not of God the Lord, and they have not beseeched God to provide wisdom for their medical art but the devil, who is the father of lies'.⁶⁸

The question was whether the weapon salve was to be counted among the devilish practices of warlocks and sorcerers or not. The disposition of *Magia incantatrix* might suggest that this was the case, as the discussion on the weapon salve followed directly after the harsh judgements on magical medicine. If so, there were also plenty of arguments he could have used. For instance, William Foster had rejected the weapon salve 'because it is no where registered in Scripture' and 'because it workes after a different manner from all naturall agents':

Whatsoever workes naturally, workes either by corporall or virtuall contact. But this workes by neither, therefore it workes not naturally. It workes not by corporall contact, the bodies are disjoyned. *Paracelsus* saith, if the weapon be annoynted, the wounded partie may be cured, though 20 miles absent.⁶⁹

However, Prytz was not so categorical. Obviously the scholars could explain curative effects of various natural phenomena and remedies, just as they could observe how the Sun ‘and the other celestial bodies operated upon the lower Creatures.’ Prytz was therefore no stranger to the idea that astral forces were transferred ‘*medite* through the air and the weather to the earthly things’.⁷⁰ So far his argument resembled Foster’s, as they both followed the Aristotelian principle that natural influence could only operate directly through the elemental matter or between closely adjacent bodies – just as in the case with the ewes and their foetuses. But despite the fact that the distance between the weapon and the wound would hinder the weapon salve to operate according to these principles, Prytz did not reject the cure outright. ‘Should now this remedy be true and natural’, he wrote, ‘it must depend on a secret and hidden force between the same salve and compress, and the blood upon the iron’.⁷¹

In accordance with his discussion on natural magic, Prytz was well aware that many things in the world were unexplainable, and that only God had full knowledge of them all. Now, although the worldly learned could not fully explain the secret forces and correspondences that occurred between things and bodies, they still separated them into two main categories of sympathies and antipathies. The attraction between magnets and iron was a clear example of sympathy, as was the often related capacity of the *echeneis*, the legendary sucking fish, to halt a ship in full sail – whereas the capacity of the torpedo fish to stun the fisherman holding the net appeared as an instance of antipathy.⁷² But Prytz also mentions other examples that to any scholar would appear as more or less self-evident. Thus it was well known that an ox would be tamed when tied to a fig tree, just as an olive tree would prosper if planted by a virgin:

Likewise there is good friendship between the snake and the fox, between the carp and the swine: but between wolf and man, item wolf and sheep, lion and rooster . . . snakes and mice, eagles and dragons and many other things are great hatred and enmity.⁷³

Prytz thus accepted the notion of sympathies and correspondences as something natural, fully in accordance with the divine order of the creation. A similar discussion on sympathies, antipathies and the ‘secret qualities’ of nature appears in the *Physica*, written by the Finnish priest, astrologer and natural philosopher Sigfridus Aronus Forsius in 1611. Here antipathies are mentioned as a reason why the dead body of a murdered man is ‘beginning to bleed’ when the murderer comes near, thus ‘recognizing its enemy’ – and here Forsius emphasised how the natural forces served ‘God’s providence, that wondrously reveals misdeeds’.⁷⁴

That a sworn enemy of witchcraft like Prytz embraced theories of occult qualities in nature should not appear too surprising. These theories were obviously cherished by Neoplatonists, and by mystics, religious dissenters and magicians, but they were also advocated by classical authorities such as Pliny the Elder, and even firmly incorporated in the scholastic traditions of medieval

and early modern philosophy.⁷⁵ In other words, although rejected by a zealous preacher like William Foster, the weapon salve was theoretically based on intellectual reasoning and scholarly traditions, coherent with contemporary natural philosophy.

However, even though Prytz argued that secret qualities, sympathies and antipathies were natural, nothing guaranteed that the effect of the weapon salve was. The preternatural ambiguity of the phenomenon remained; 'If now this healing force of the iron, is not acquired through such secret *sympathiam*', Prytz argued, it is not natural, 'but a work of the devil and an art of witchcraft'.⁷⁶ Here the discussion ends abruptly, and in the following chapter a totally different issue is being treated.

Prytz's conclusion thus seems to be the cautious one: as it was impossible to know the nature of the phenomenon, it could very well be witchcraft. Therefore, it could be argued that Prytz's purpose may have been to discredit the weapon salve without going against the authority of the physicians, and to reject this potentially dangerous method, whose inner nature was hidden even to the scholars. But we also have to see to the general insecurity of the preternatural as such, and to the fact that the distinction between sorcery and natural magic was discerned, not primarily by method or practice, but by the authority and character of the practitioner. To some extent, it may even be argued that the question of the weapon salve was left open due to the pastoral purpose of the text. As the natural or unnatural character of the practice was discerned by whom it was being exercised, for what ends and in whose interest – God's or the devil's – it was the task of the clerical reader to make this distinction from case to case.

Despite all clerical ambition to create clear categories and separate natural arts from sorcery, it was in other words not specified practices or disciplines that were problematic, but the issue of the ethical and epistemological limits of human knowledge. In the firmly religious and magical worldview revealed in Prytz's treatise, there was no such thing as innocuous or harmless knowledge. There was no kind of knowledge that did not emanate from the Lord through his *Logos*, and there was no kind of knowledge that could not be perverted by the Father of Lies. Yet in his discussion on witchcraft and natural magic, Prytz stands on a solid, scholarly and philosophical ground, far from the Biblicist approach we may have expected from the traditional view of the 'orthodox' theologians of the Swedish Reformation. Prytz argues as a scholar in his discussion on natural magic and sorcery, and not, as may have been expected, as a preacher.

Notes

1 Cod. Linc. N20 fol. 61v.

2 Cod. Linc. N20 fol. 1r.

3 Laurentius Laurentii Laurinus, *Idea doctrinae de pastore fideli. Een christeligh predikan aff Christi intimation och epistel til biskopen i Smyrna . . . M. Erii Johannis Prytz . . . begraffning*

- i Kudby kyrkio then 29 Septembris, år 1637.*, Christopher Günther, Linköping 1639 sig. C1v–C2r.
- 4 Avreoli Philippi Theophrasti Paracelsi philosophorum atque Medicorum excellentissimi, *De summis Naturae mysterijs Libri tres* (Basel, 1570), 127–129.
 - 5 Ibid. In the text, the weapon salve appears as a variety of an ointment that should be used on a stick with the patient's blood upon it.
 - 6 Rudolph Goclenius, *Tractatus de magnetica vulnerum curatione* (Marburg, 1613) (1608); Stuart Clark, *Thinking with Demons: the Idea of Witchcraft in Early Modern Europe* (Clarendon: Oxford, 1997), 269–270; Allen G. Debus, 'Robert Fludd and the Use of Gilbert's *De Magnete* in the Weapon-Salve Controversy,' *Journal of the History of Medicine and Allied Sciences* 19 (1964), 389–417; Peter J. Forshaw, "'Paradoxes, Absurdities, and Madness': Conflict over Alchemy, Magic and Medicine in the Works of Andreas Libavius and Heinrich Khunrath', *Early Science and Medicine* 13 (2008), 78–79; Walter Pagel, *Joan Baptista Van Helmont: Reformer of Science and Medicine* (Cambridge, 1982), 8–12.
 - 7 William Foster, *Hoplocrisma-spongus: Or, A Sponge to Wipe Away the Weapon-salve: A Treatise, Wherein it is Proved, that the Cure Late-taken Up Amongst Us, by Applying the Salve to the Weapon, is Magicall and Unlawfull* (London, 1631); Robert Fludd, *Doctor Fludd's Answer vnto M. Foster, or The Sqvezing of Parson Fosters Sponge, Ordained by Him for the Wiping Away of the Weapon-Salve* (London, 1631).
 - 8 Pagel, *Joan Baptista Van Helmont*, 9–10.
 - 9 Wolf-Dieter Müller-Jahncke, 'Magische Medizin bei Paracelsus und den Paracelsisten: Die Waffensalbe', in Hartmut Rudolph and Peter Dilg (eds.), *Resultate und Desiderate der Paracelsus-Forschung*, Sudhoffs Archiv. Beihefte 31 (Stuttgart, 1993), 48.
 - 10 Sir Kenelm Digby, *A Late Discourse Made in a Solemne Assembly of Nobles and Learned Men at Montpellier in France . . . Touching the Cure of Wounds by the Powder of Sympathy. With Instructions How to Make the Said Powder; Whereby Many Other Secrets of Nature are Unfolded.*, 4 ed. (London, 1664), 3.
 - 11 Martin Kjellgren, *Taming the Prophets: Astrology, Orthodoxy and the Word of God in Early Modern Sweden* (Lund, 2011), 27; for the concept of disenchantment, see Max Weber, *The Protestant Ethic and the Spirit of Capitalism* (1904–1905) (London and New York, 2001), 61–62, 71.
 - 12 Pagel, *Joan Baptista Van Helmont*, 9–10.
 - 13 See Hildred Geertz, 'An Anthropology of Religion and Magic', *Journal of Interdisciplinary History* VI:I (1975); Stanley Jeyaraja Tambiah, *Magic, Science, Religion, and the Scope of Rationality* (Cambridge, 1990); Richard Kieckhefer, 'The Specific Rationality of Medieval Magic', *The American Historical Review* 99, no. 3 (1994); Robert W. Scribner, 'The Reformation, Popular Magic, and the 'Disenchantment of the World'', *Journal of Interdisciplinary History* XXIII:3 (1993); Charles Webster, *From Paracelsus to Newton: Magic and the Making of Modern Science* (Cambridge, 1982); Andrew Cunningham & Perry Williams, 'De-centring the 'big picture': *The Origins of Modern Science* and the modern origins of Science', *The British Journal for the History of Science* 26, no. 4 (December 1993).
 - 14 For a study on the relation between fears of heresy and notions of witchcraft, see Gary K. Waite, *Heresy, Magic and Witchcraft in Early Modern Europe* (Basingstoke, 2003), esp. 229–234; For discussions on how laypeople tended to regard witchcraft as a kind of heresy, and how the witch trials in Malmö in the 1570s and 1580s may be used to demonstrate how worldly courts took active part in persecuting witches, see Marie Lindstedt Cronberg 'Guds folk och Djävulens anhängare: Onda praktiker och kampen mot magi i reformationens tidevarv', in Catharina Stenqvist and Marie Lindstedt Cronberg (eds.), *Dygder och laster: förmoderna perspektiv på tillvaron* (Lund, 2010), 117–124; Bengt Ankarloo, *Trolldomsprocesserna i Sverige*, Skrifter utgivna av Institutet för rättshistorisk forskning, Rättshistoriskt bibliotek 36, (Stockholm, 1971), 52–65; 95–102; Linda Oja, *Varken Gud eller natur: synen på magi i 1600- och 1700-talets Sverige* (Stockholm, 2000), 59–63.
 - 15 For a discussion on state formation, social discipline and confessionalization in early modern Europe and Sweden, see Erland Sellberg, *Kyrkan och den tidigmoderna staten: en konflikt om Aristoteles, utbildning och makt* (Stockholm, 2010), 12–38.

- 16 Cit. Revelations 12:12 (KJV); cf. the official prayers ordained ‘against the wrath of Satan’ during the great Swedish witch trials in the 1670s, see Ankarloo, *Trolldomsprocesserna i Sverige*, 319.
- 17 Sten Lindroth, *Paracelsismen i Sverige till 1600-talets mitt* (Uppsala, 1943), 421.
- 18 Nils Erik Villstrand, *Sveriges historia. 1600–1721*, Norstedt (Stockholm, 2011), 324.
- 19 Kjellgren, *Taming the Prophets*, 54–55, 143; Sellberg, *Kyrkan och den tidigmoderna staten*, 108–112; Sten Lindroth, *Svensk lärdomshistoria II: Stormaktstiden* (Stockholm, 1975), 16–19, 387.
- 20 Erik Petersson & Annika Sandén, *Mot undergången: ärkebiskop Angermannus i apokalypsens tid* (Stockholm, 2012), 187–196.
- 21 Cit. Exodus 22:18 (KJV); Henrik Munktel, ‘Mose lag och svensk rättsutveckling. Några huvuddrag’, *Lychnos* (1936), 136–139.
- 22 Håkan Håkansson, *Vid tidens ände: om stormaktstidens vidunderliga drömvärld och en profet vid dess yttersta rand* (Göteborg, 2014), 448–453; Robin Bruce Barnes, *Prophecy and Gnosis: Apocalypticism in the Wake of the Lutheran Reformation* (Stanford, CA:, 1988), 249.
- 23 Laurinus, *Idea doctrinae de pastore fideli* sig. C1v.
- 24 Laurinus, *Idea doctrinae de pastore fideli* sig. Ibid., C2r.
- 25 Ankarloo, *Trolldomsprocesserna i Sverige*, 71.
- 26 Johan Alfred Westerlund, Johan Axel Setterdahl & Erik Meurling, *Linköpings stifts herdaminne*. D. 3, Linköping, 1919, 95.
- 27 Cit. Cod. Linc. N20 fol. 85r; the same case is mentioned earlier in the text, but then the two witches were reported to have been executed in 1618, Ibid., fol. 18r.
- 28 Ankarloo, *Trolldomsprocesserna i Sverige*, 70–71.
- 29 Cod. Linc. N20 fol. 1r; cf. Micah 5:2.
- 30 Cod. Linc. N20 fol. 1r.
- 31 Cod. Linc. N20 fol. 5r.
- 32 Cod. Linc. N20 fol. 5v–6r; Pliny, *Naturalis historia* VII:15, XXX:1; cf. the Wisdom of Solomon 7:3.
- 33 Cit. Pliny, *Naturalis historia* XXX:1; cf. Tambiah, *Magic, Science, Religion*, 9; Karen Jolly, ‘Medieval Magic: Definitions, Beliefs, Practices’, in Karen Jolly, Catharina Raudvere and Edward Peters (eds.), *Witchcraft and magic in Europe. Vol. 3, The Middle Ages* (London, 2002), 6.
- 34 Cod. Linc. N20 fol. 5v.
- 35 Cit. Genesis 9:22 (KJV); David M. Whitford, *The Curse of Ham in the Early Modern Era: The Bible and the Justifications for Slavery* (Farnham, Surrey, 2009), 55; according to Whitford, the earliest instance of the identification of Zoroaster with Ham occur in the Pseudo-Clementine *Recognitos Divi Clementis* (fourth century).
- 36 Laurentius Paulinus Gothus, *L. Paulini Gothi, Ethicae christianae pars prima, de ratione bene vivendi. Thet är: Catechismj förste deel, om Gudz lagh, . . .* (Stockholm, 1617) pp., 192, 194.
- 37 Cod. Linc. N20 fol. 13r; cf. 2 Tim. 2:26.
- 38 Cod. Linc. N20 fol. 13v.
- 39 Cod. Linc. N20 fol. 15r.
- 40 Olaus Magnus, *Historia de gentibus septentrionalibus*, Rome 1555, book 3:16 (“De magis et maleficis finnorum”), 119–120.
- 41 Cod. Linc. N20 fol. 8r–9v.
- 42 Cod. Linc. N20 fol. 6r; cf. Polydorus Vergilius, *De rerum inventoribus libri octo*, Geneva 1590, p. 86.
- 43 Cod. Linc. N20 fol. 6v–7r; cf. Isaiah 47:12–13.
- 44 Paulinus, *Ethicae christianae pars prima*, 194.
- 45 Cf. Ibid., 180–184.
- 46 Martinus Olai Stenius (praes.) & Ericus Johannis Prytz (resp.), *Disputatio de incertitudine et vanitate praedictionum astrologicarum* (Dissertation Uppsala University, Andreas Gutterwitz’ widow, Stockholm, 1611); Kjellgren, *Taming the Prophets*, 177–183.
- 47 See for instance the discussion on physics in Laurentius Paulinus Gothus, *Historia arctoa libri tres* (Strängnäs, 1636), 7–12; Sellberg, *Kyrkan och den tidigmoderna staten*, 269–284; cf.

- Peter Harrison, *The Bible, Protestantism, and the Rise of Natural Science* (Cambridge, 1998), 198; Håkan Håkansson, *Seeing the Word*, 85, 96–100; cf. John 1:1–18.
- 48 For a discussion on natural magic and occultism in the classical tradition of early modern Europe, see Brian C.openhaver, ‘Natural Magic, Hermetism and Occultism in Early Modern Science’, in David C. Lindberg and Robert S. Westman (eds.), *Reappraisals of the Scientific Revolution* (Cambridge, 1990), 262–301.
- 49 Kieckhefer, ‘The Specific Rationality of Medieval Magic’, 815–817; cit. Eph. 6:12 (KJV).
- 50 Thommaso Campanella, *De sensu rerum et magia*, Frankfurt/Main 1620 s. 302, quoted in Müller-Jahncke, ‘Magische Medizin bei Paracelsus und den Paracelsisten’, 47.
- 51 Paulinus, *Ethicae christianae*, 192.
- 52 Cod. Linc. N20 fol. 13v–14r.
- 53 Cod. Linc. N20 fol. 14v–15r.
- 54 Cod. Linc. N20 fol. 14r.
- 55 Cod. Linc. N20 fol. 14v.
- 56 For a short critical discussion on the notion of maternal imprinting, see Wendy Doniger and Gregory Spinner, ‘Misconceptions: Female Imaginations and Male Fantasies in Parental Imprinting’, *Daedalus* 127, no. 1 (1998), 97–129.
- 57 Johannes Messenius (praes.) and Sveno Nicolai Gudhemius (resp.), *Theoremata physiomagica* (Dissertation, Uppsala University, Andreas Gutterwitz, Stockholm, 1610), thesis 33–34; cf. Lindroth, *Paracelsismen i Sverige*, 261.
- 58 Cit. Lindroth, *Svensk lärdomshistoria II*, 16; *Theoremata physiomagica*, copy in the collections of Uppsala University Library.
- 59 Digby, *A Late Discourse*, 14.
- 60 Debus, ‘Robert Fludd and the Use of Gilbert’s *De Magnete*’, 392.
- 61 Foster, *Hoplocrisma-spongus* p.m, 15.
- 62 Cod. Linc. N20 fol 7r.
- 63 Martin Luther, *D. M. Luthers Werke. Kritische Gesamtausgabe: Tischreden*, vol. I:360, (Weimar, 1912) p., 151; cf. Håkan Håkansson, “‘Människan är född till olycka, såsom fågeln till att flyga’”: medicin och religion i reformationen och stormaktstidens Skandinavien”, in Gunnar Broberg (red.), *Til at studera läkedom: ti studier i svensk medicinhistoria*, Sekel (Lund, 2008), p. 87.
- 64 Wilhelm Lemnius, *Emoot Pestilentzie huru hwar och een menniskia sigh hålla skal/ bådhe gamble och vnge/rijke och fattige/til itt tjensteligit rådth och hielp* (Stockholm, 1572) sig. A1r, A2v; cf. Sir. 38:15.
- 65 [Simon Berchelt], *Een lithen wnderwijsningh om Pestilentz/ hennes Begynnelse/ Rum/ Kennemerkir/ Orsaaker och Läkiedomar*, Andreas Gutterwitz, Stockholm 1588, UUB Rar. 10:246 sig. A2r–v.
- 66 Cod. Linc. N20 fol 57v–58r; cf. Sirach 38:1–2.
- 67 Cod. Linc. N20 fol 58r.
- 68 Cod. Linc. N20 fol. 58r–v.
- 69 Foster, *Hoplocrisma-spongus*, 5.
- 70 Cod. Linc. N20 fols. 63 r–v.
- 71 Cod. Linc. N20 fol. 64r.
- 72 Copenhaver, ‘Natural Magic, Hermetism and Occultism’, 279.
- 73 Cod. Linc. N20 fol. 64v.
- 74 Sigfridus Aronus Forsius, *Physica: (Cod. Holm. D 76)*, Lundequistska bokhandeln (Uppsala, 1952), pp. 61–63, cit p. 63.
- 75 Copenhaver, ‘Natural Magic, Hermetism and Occultism’, 281; Kieckhefer, ‘The Specific Rationality of Medieval Magic’, 819.
- 76 Cod. Linc. N20 fol. 64v.

Index

- Aalborg 2
Aarhus 2, 105
Agricola, Georg 21, 43
Albertus Magnus 21
Andernach, Johannes Guinter von 166
Andreae, Jacob 46
Angermannus, Abraham 203
Aristotle 8–16, 20, 21, 22–3, 31, 52, 162, 163, 181
Arndt, John (Johann) 52, 54, 89, 90–1, 105
Aselli, Gasparo 147
Aslaksson, Cort (Kurt) 5, 44, 50, 62, 64–9, 75, 89, 91, 101
Augsburg Confession 47
Augustine 93
- Bannister, John 142
Bartholin, Caspar, the Elder 4, 6, 22, 31, 41, 43, 55, 57, 63, 82, 86–7, 91–5, 103, 104, 107, 117–18, 137–42, 148
Bartholin, Caspar, the Younger 149
Bartholin, Erasmus 142–4
Bartholin, Thomas 6, 117–35, 138, 144, 146–50
Basil Valentine 27
Basle 45, 51
Basle University 137, 138, 139, 144
Bauhin, Caspar 139
Beza, Theodore 49, 51, 92
Billich, Günther 30
Bircherod, Jacob 121, 122
Bodenstein, Adam von 92
The Book of Concord 46, 93
Boyle, Robert 20
Brahe, Sophie 103, 104, 105, 113
Brahe, Tycho 5, 6, 15, 21, 49, 50, 51, 60, 61–81, 84, 87, 88, 101, 103, 141, 144, 158, 173, 178, 187
Brochmand, Jesper 6, 53–7, 91–2, 103, 111, 112, 113
- Bruno, Giordano 53, 176, 177, 189
Bugenhagen, Johannes 2, 38, 41, 42, 43, 47, 82
Bureus, Johannes 6, 171–98
- Calvin, Jean 47, 50, 68
Campanella, Tommaso 208
Cardano, Girolamo 161
Casmann, Otto 162, 163
Charles (Karl) IX, (Duke) King of Sweden 2, 3, 153, 154, 156–7, 165, 171, 173, 178, 183
Chemniz, Martin 93
Christian II, King of Denmark–Norway 1, 2, 38
Christian III, King of Denmark–Norway 1, 4, 41, 42, 82
Christian IV, King of Denmark–Norway 4, 5, 41, 52, 104, 109, 112
Clavius, Christopher 184, 187
Comenius, Amos 4, 99, 187
Commentarius de Anima (Melanchthon) 11, 14
Conring, Hermann 144
Copenhagen 2, 137
Copenhagen University 4, 5, 6, 39, 44, 45, 47, 82, 83, 85, 86, 88, 103, 106, 111, 117, 136, 139, 143; new statutes (1539) 41, 43, 46, 55, 56; *Novellae Constitutiones* (1621) 108
Copernicus, Nicolaus 15, 16, 66, 70, 189
Counter-Reformation 3, 4
Cramer, Daniel 99–104, 108, 110
Croll, Oswald 87, 142, 199
Cusanus, Nicolaus 176, 178
- Dee, John 53
Descartes, René 129, 143
Digges, Thomas 174, 176
Döring, Michael 22, 23, 26, 31, 32

Dorn, Gerhard 184, 185, 186

Dury, John 4, 99, 111

Elsinore 2

Erastus, Thomas 30

Erik XIV, King of Sweden and Finland 2, 3

Fabricius, Jacob 112

Falloppio, Gabriele 28

Fernel, Jean 28, 30, 140

Ficino, Marsilio 141, 166, 181, 189

Fincke, Thomas 43, 100

Fludd, Robert 199

Forbes, John 3

Formula of Concord 51, 100

Forsius, Sigfrid Aronus 6, 153–70

Foster, William 199, 210, 211, 213

Fracastoro, Girolamo 28

Frandsen, Hans 42, 44

Frank, Johann Peter 138

Frederick William I, Duke of
Saxe-Weimar 182

Frederik I, King of Denmark-Norway
1, 2, 4

Frederik II, King of Denmark-Norway 5,
44, 46, 48, 108, 173, 178

Frederik III, King of Denmark-Norway
112, 144

Freitag, Johann 31

Fuchs, Leonhart 42

Galen 15, 21, 23, 31, 42, 140

Galilei, Galileo 172, 189

Gellius, Aulus 164

Goclenius, Rudolph 162, 199, 200, 201

God 9–11 and *passim*

Gothus, Laurentius Pauinus 206, 208

Gustavus Adolphus, King of Sweden and
Finland 3, 4, 154, 202, 203

Hartlib, Samuel 99, 114

Hartmann, Johann 22, 23

Harvey, William 117, 147

Hasebard, Jakob 106

Helmont, Jan Baptiste van 21, 30, 143,
199, 200

Helmstedt University 137, 144

Hemmingsen, Niels 2, 4, 6, 46–51, 93, 100

Herlitz, David 154

Hermes Trismegistus 181, 187

Heurne, Jan van 140

Horst, Johan Daniel 128

Hven, Island of 5, 65, 69, 104

Initia doctrinae physicae (Melanchthon)
9, 158

Institutiones rhetoricae (Melanchthon) 107

Jacobaeus, Matthias 120

Jacobsen, Laurids 121

James VI, King of Scotland 47

Jessenius, Jan 6, 21, 175, 176, 181, 182, 183

Jewish Antiquities (Josephus) 184

Johan (John) III, (Duke) King of Sweden 2,
3, 155, 171, 204

Johnson, Sampson 106

Jonston, Johannes 145

Joubert, Laurent 30

Jungius, Joachim 20

Kaas, Niels 49

Kalmar Union 173

Kempis, Thomas à 88

Kepler, Johannes 60, 76, 87, 141, 172, 185

Khunrath, Heinrich 186

Klotz, Stephan 111

Krag, Anders 43, 52, 100, 103

Latin schools in Denmark 39, 40

Laud, William, Archbishop of Canterbury 4

Laurinus, Laurentius 203

Leiden University 137, 142, 146

Leipzig University 8, 50

Lemnius, Wilhelm 211

Libavius, Andreas 20, 21, 142, 199

Liber de Anima recognitus (Melanchthon) 9,
11, 17, 158

Loci communes (Melanchthon) 9, 45, 50

Longomontanus, Christian 5, 6, 43, 62,
69–75, 87, 141

Luther, Martin 8–19, 54, 93, 211

MacAlpine, John 46

Magic 6

Magirus, Johannes 156, 157, 159, 161, 162,
166, 167

Magnus, Johannes 185

Magnus, Olaus 206

Malmö 2

Marburg University 156, 165, 166, 199

Martini, Olaus, Archbishop 3

Mattioli, Pietro Andrea (Pierandrea)
23, 166

Melanchthon, Philip (Phillip) 5, 8–19, 20,
33, 38, 39, 40, 42, 54, 60, 61, 66, 83, 93,
118, 174, 183

Milich, Jacob 159

- Minadous, Giovanni Tommaso 28
 Mirandola, Pico della 186, 187
 Monsters 117–35
 Morsing, Christian Torkelsen 41–3, 137

 Neoplatonists 212

 Odense 2, 106, 121
 Odense Castle 110
 Oecolampadius, Johannes 42, 92
 Olofsson, Jon 155
 Orosius, Paulus 205
 Osiander, Andreas 185

 Paaske, Niels 106
 Padua University 137, 138, 139, 144, 145, 146
 Palingenius, Marcellus 177
 Palladius, Peter 2, 39
 Paracelsianism 50, 53, 87, 104
 Paracelsus 21, 23, 42, 52, 84, 105, 160, 161, 162, 166, 167, 199, 210
 Patin, Gui 125
 Patrizi, Francesco 175, 176, 181, 182
 Payngk, Peter 4, 104
 Peace of Stettin 4
 Peucer, Caspar 6, 20, 21, 33, 45, 48, 49, 61, 68, 69, 70, 141
 Plater, Felix 23, 127, 138
 Plato 52
 Polydore Vergil 207
 Porta, Giambattista della 87
 Postel, Guillaume 183
 Prague 4
 Prytz, Ericus Johannis 6, 199–216
 Pseudo-Geber 20, 21
 Pseudo-Lull, Raymond 21

 Ramus, Petrus 43, 51, 100, 101, 180
 Reimers, Nicolaus *see* Ursus
 Resen, Hans Poulsen 2, 6, 41, 50, 51, 53, 54, 55, 57, 88, 89
 Reuchlin, Johann 186
 Rheticus, Georg Joachim 21, 61
 Rhodius, Johan 137, 138, 144–50
 Riber, Anders Christensen 100
 Riolan, Jean 141
 Riper, Christian Hansen 5
 Rosenholm Castle 5
 Rosenkrantz, Holger, ‘the Learned’, 5, 6, 52, 54, 55, 56, 89, 91–2, 99–116
 Rosenkrantz, Jørgen 127
 Rostock University 45, 99, 137, 139

 Royal College, Stockholm 153
 Royal Society (London), 123
 Rudbeck, Olof 117
 Rudbeckius, Johannes 154, 183
 Rudolph II, Emperor 4, 26

 Sacerides, Gellius 5
 Scaliger, Julius Caesar 20
 Scheiner, Christian 183, 189
 Schooten, Frans van 143
 Scientific Revolution 20
 Sennert, Daniel 5, 20–37, 107, 145, 199
 Seven Years’ War 4
 Severinus, Peter, the Dane 4, 49, 53, 63, 84, 139, 142
 Sigismund, King of Poland 3, 153, 154, 171, 173, 202
 Skovgaard, Hans Andersen 22
 Slangerup, Ole Hansen 106
 Smith, Henrik 42
 Sorø Academy 108–9, 113, 114, 127, 145
 Spalatin, Georg 12
 Stahl, Georg Ernst 30
 Stockholm 1, 153, 154
 Sylvius, Franciscus de la Böe 147

 Thirty Years’ War 22, 85, 105, 109, 147
 Thott, Brigitte 106
 Titelmann, Francis 158, 160
 Tradescant, John 143
 Trithemius, Johannes 171

 Union of the Scandinavian Kingdoms 1
 United Provinces 105, 138
 Uppsala Assembly 2, 3
 Uppsala University 3, 153, 156, 163, 180, 183, 202, 207, 209
 Uraniborg 5, 50, 62, 67, 69, 71, 178
 Ursus 175

 Valckenburg, Adrian 143
 Vasa, Gustav, King of Sweden–Finland 1, 2
 Venusin, Jon Jacobsen 88
 Vesalius, Andreas 141, 142
 Vesling, Johan 145

 Walaeus, Johannes 143, 146
 Wandal, Hans 106
 Wandal, Peder 111
 Weber, Max 200
 Weyer, Felix 142
 Wilhelm, Landgrave of Hesse 46
 Willis, Thomas 30

- Winstrup, Peder 112, 113
Wittenberg 8, 86, 107, 182
Wittenberg University 2, 4, 5, 8–19, 20, 45,
46, 50, 51, 100, 113, 136, 141, 204
Worm, Ole 22, 43, 53–4, 63, 92, 113, 137,
142, 143, 146
Zabarella, Jacopo 20
Zanchi, Girolamo 158, 159, 161, 164, 165
Zoroaster 205, 207
Zwickau, prophets of 8
Zwinger, Jacob 137, 138
Zwinger, Theodor 136, 137, 139, 149